

# Circuit diagrams

## Circuit notes

### COMPONENT VALUES

Resistors : no suffix = ohms, k = kilohms, M = megohms.

Capacitors : no suffix = microfarads, p = picofarads, n = nanofarads.

† value selected during test, nominal value shown.

### VOLTAGES

Voltage measurements were made using a  $20 \text{ k}\Omega/\text{V}$  meter, and are shown adjacent to the point to which the measurement refers.

### WAVEFORMS

Oscillograms were taken using a dual trace, 100 MHz bandwidth, oscilloscope, and a  $\times 10$  probe. Control settings of the TF 2370 together with oscilloscope triggering information, and horizontal and vertical sensitivities at the probe tip, are shown.

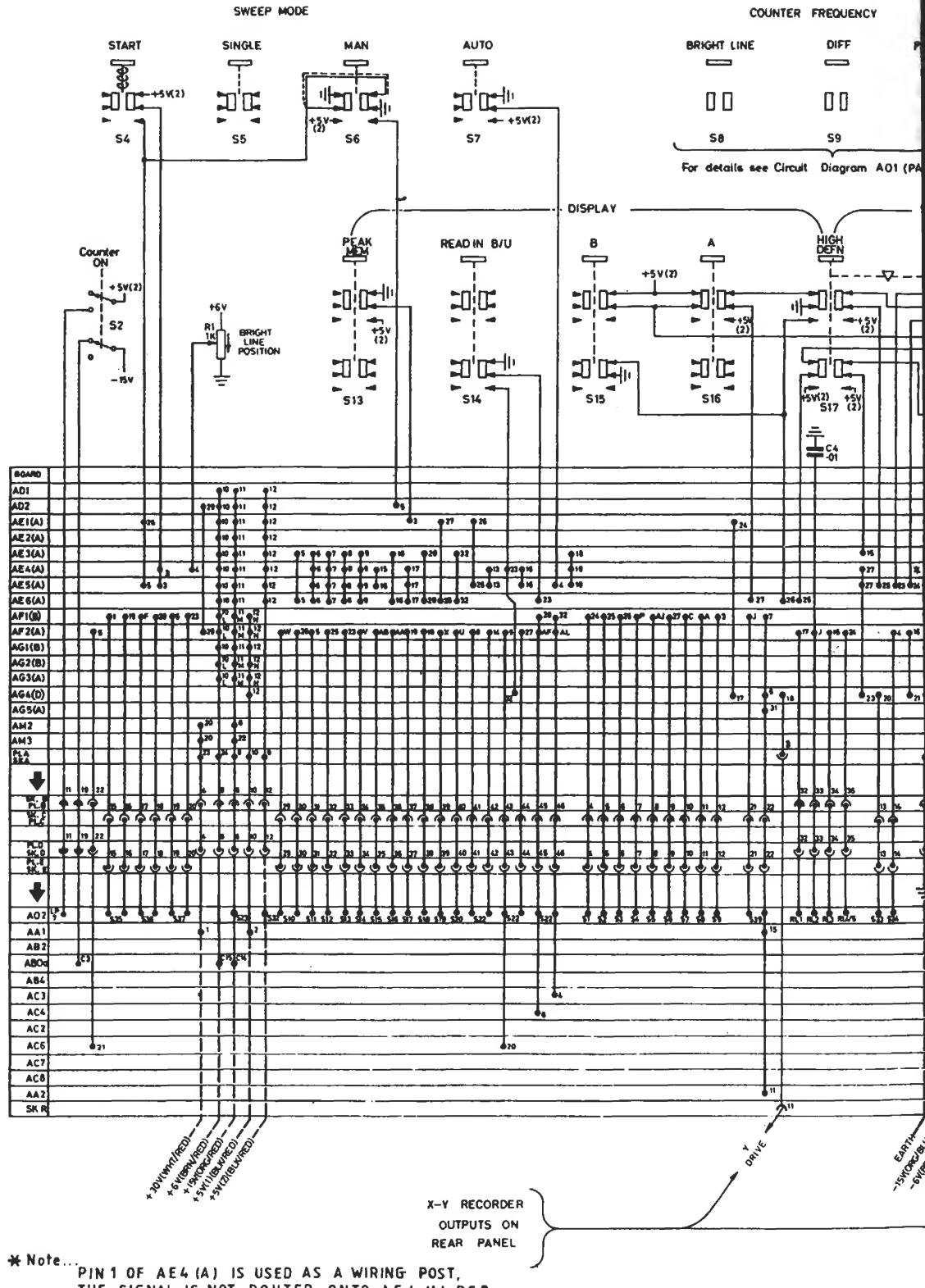
### SYMBOLS

Symbols are in accordance with BS 3939 with the following additions :

 test point

 waveform reference number

 sub-assembly designation



Z 44454-006V ISSUE 22

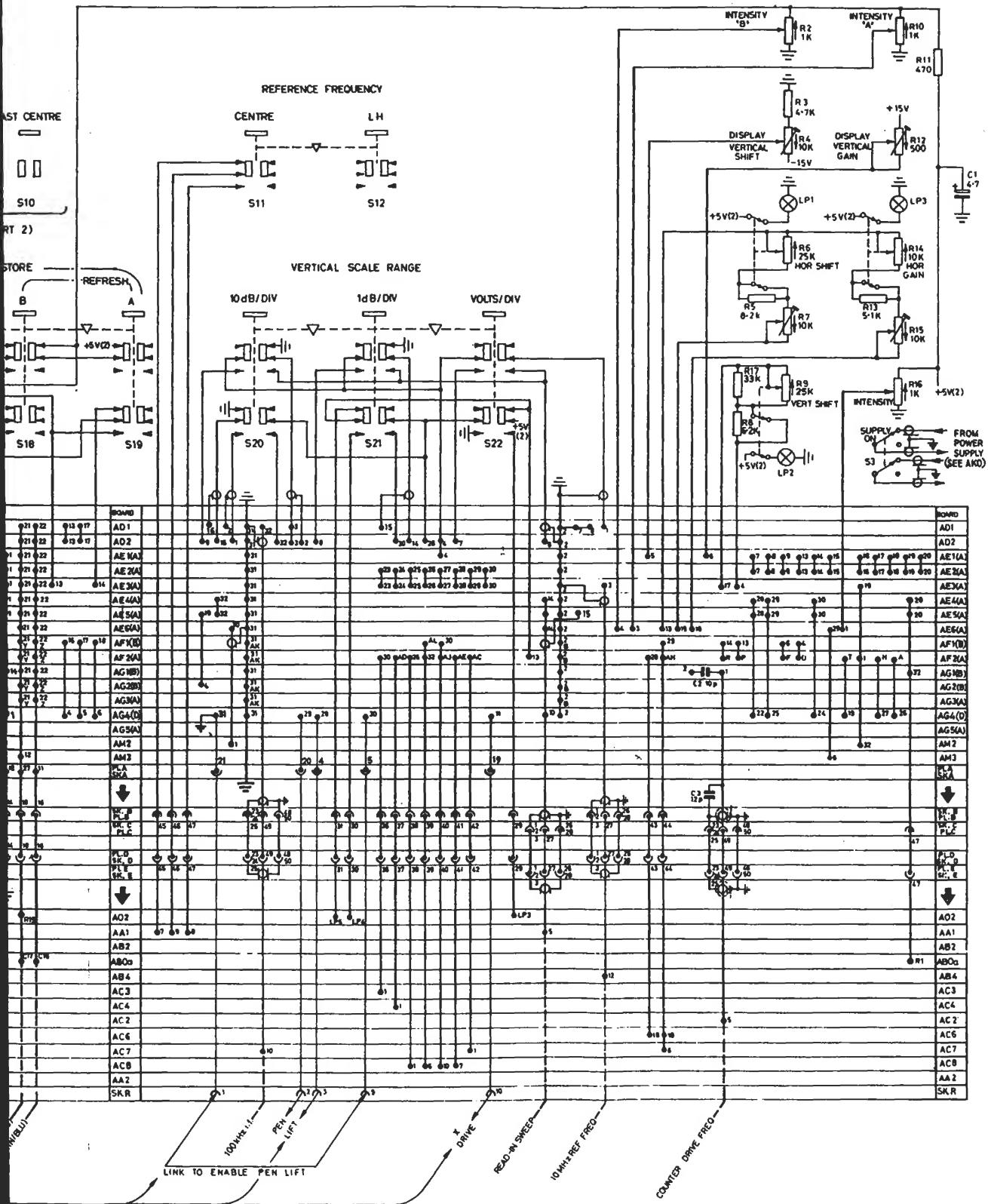
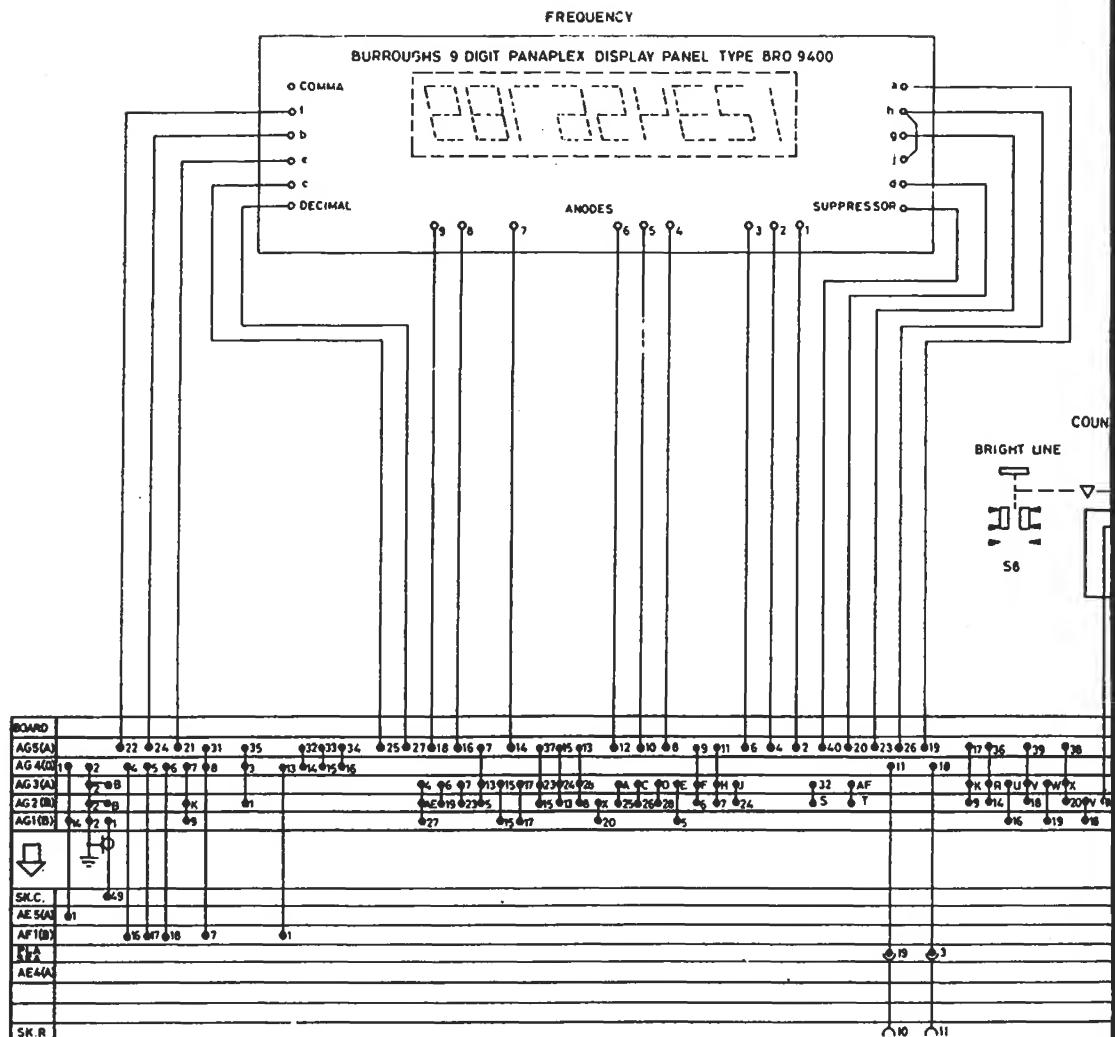


Fig. 7.1 Front panel wiring A01 (part 1)



PLA WIRING CONNECTIONS

Pin no.	Destination.	Pin no.	Destination.	Pin no.
1.	Braid of co-ax from pin 25 on AM2.	11.	-6V (Blue/Brown) to:-	25.
2.		(a) Pin 22 on AD1, AD2, AE1(A), AE2(A), AE3(A), AE4(A), AE5(A), AE6(A), AG1(B) & pin 22 & 2 on AF1(B), AF2(A)	26.	
3.	Lead to pin 18 on AG4(D)	(b) Pin 16 on SK.B.	27.	
4.	Lead to pin 28 on AG4(D)	12. Earth.		
5.	Lead to pin 30 on AG4(D)	13. Lead to c.r.t. heater.		
6.		14.		
7.	+80V (Red/Green) to:- Pin 8 of AM2 and pin 8 of AM3.	15. Mains supply lead (see details on AKO)	28.	
8.	+15V (Red/Orange) to:-	16. Mains supply lead (see details on AKO)	29.	
	(a) Pin 11 on AD1, AD2, AE1(A), AE2(A), AE3(A), AE4(A), AE5(A), AE6(A), AF1(B), AF2(A), AG2(B) & AG3(A), AF1(B), AF2(A), AG2(B) & AG3(A), (b) Pin 6 on AM2 and pin 22 on AM3. (c) Pin 6 on SK.B.	17. Inner of co-ax from pin 26 of AM2	30.	
9.	+5V(2) (Red/Black with red sleeve) to:-	18. Lead to pin 11 on AG4(D)	31.	
	(a) Pin 12 on AD1, AD2, AE1(A), AE2(A), AE3(A), AE4(A), AE5(A), AE6(A). (b) All upper front panel connections (see A01 Part 1.) (c) Pin 12 on SK.B.	19. Lead to pin 29 on AG4(D)	32.	
10.	+5V(1) (Red/Black with brown sleeve) to:-	20. Lead to pin 31 on AG4(D)		
	(a) Pin 12&N on AF1(B), AF2(A), AG2(B) & AG3(A) and Pin 12 on AG1(B) & AG4(D). (b) Pin 16 on SK.B.	21. +200V to pin 28 of AG5(A) [RED]		
		22. +30V (Red/White) to:-		
		(a) Pin 20 of AM2 and pin 20 of AM3 (b) Pin 4 on SK.B.		
		23. -6V (Red/Brown) to:-		
		(a) Pin 10 on AD1, AD2, AE1(A), AE2(A), AE3(A), AE4(A), AE5(A), AE6(A), AG1(B) & pin 10 & Lon AF1(B), AF2(A), AG2(B) & AG3(A). (b) Pin 8 on SK.B. (c) R1 on A01 (Part 1)		

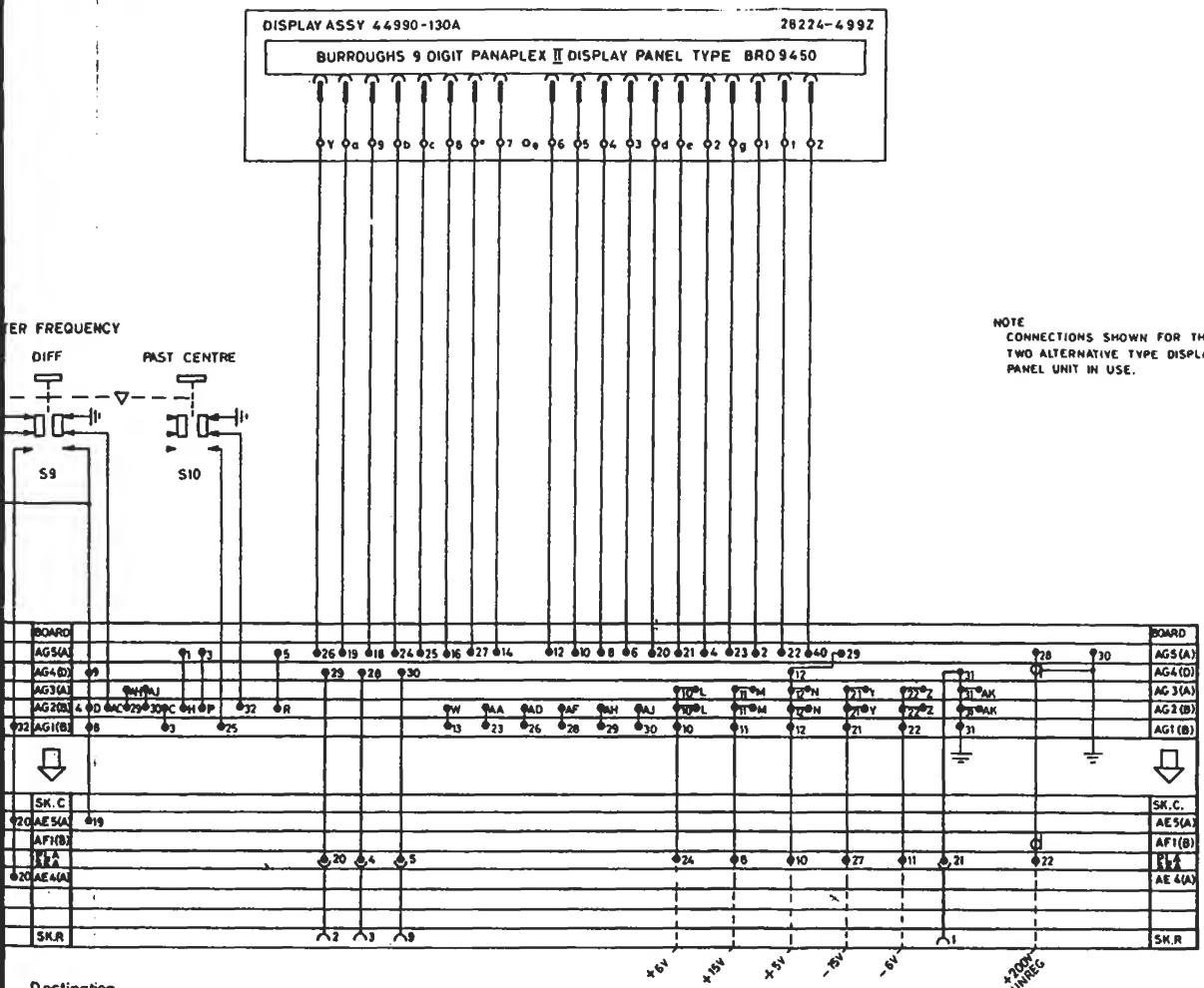
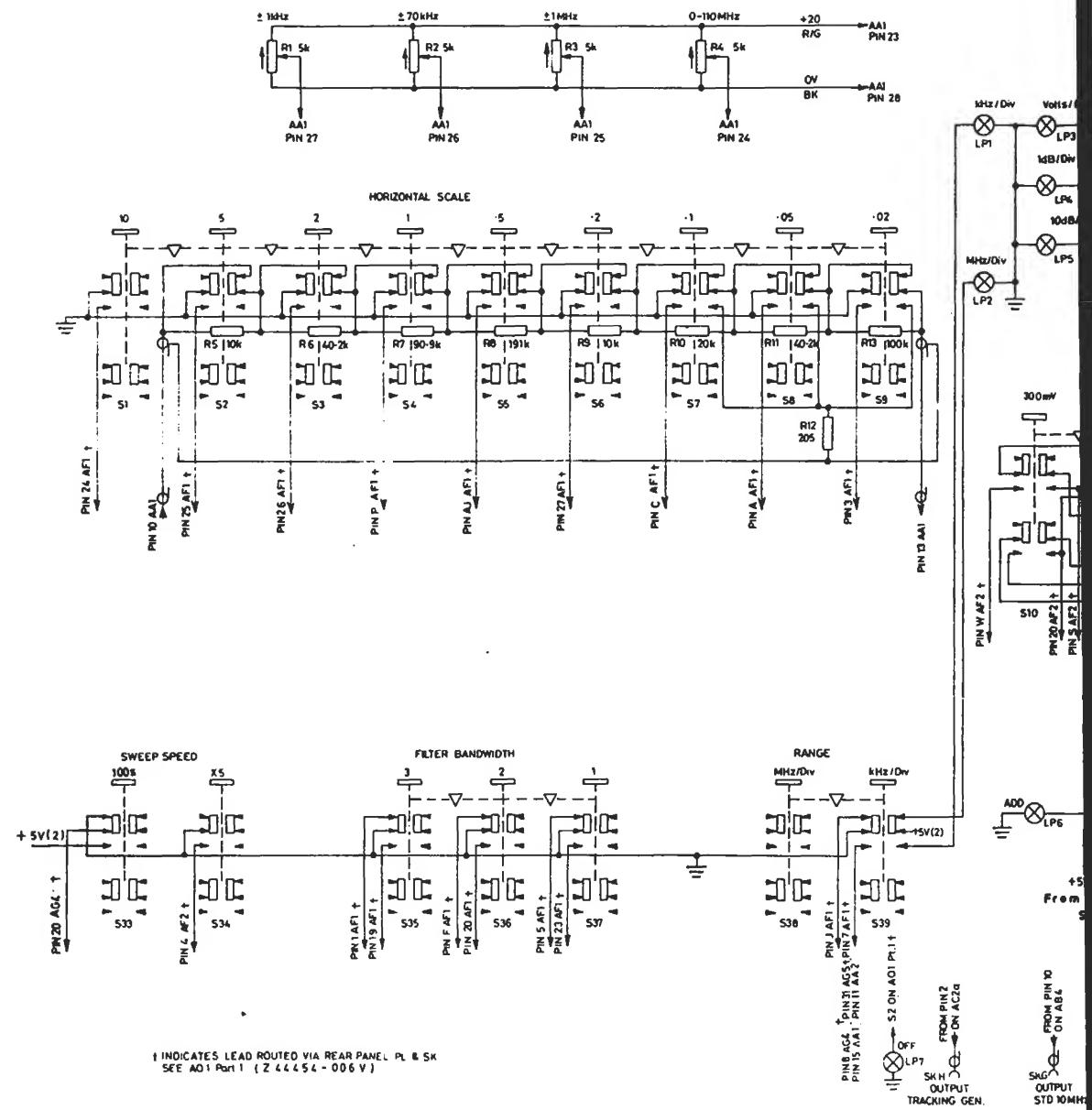


Fig. 7.2 Upper front panel wiring A01 (part 2)



† INDICATES LEAD ROUTED VIA REAR PANEL PL & SW  
SEE A01 Part 1 (Z44454-006 V)

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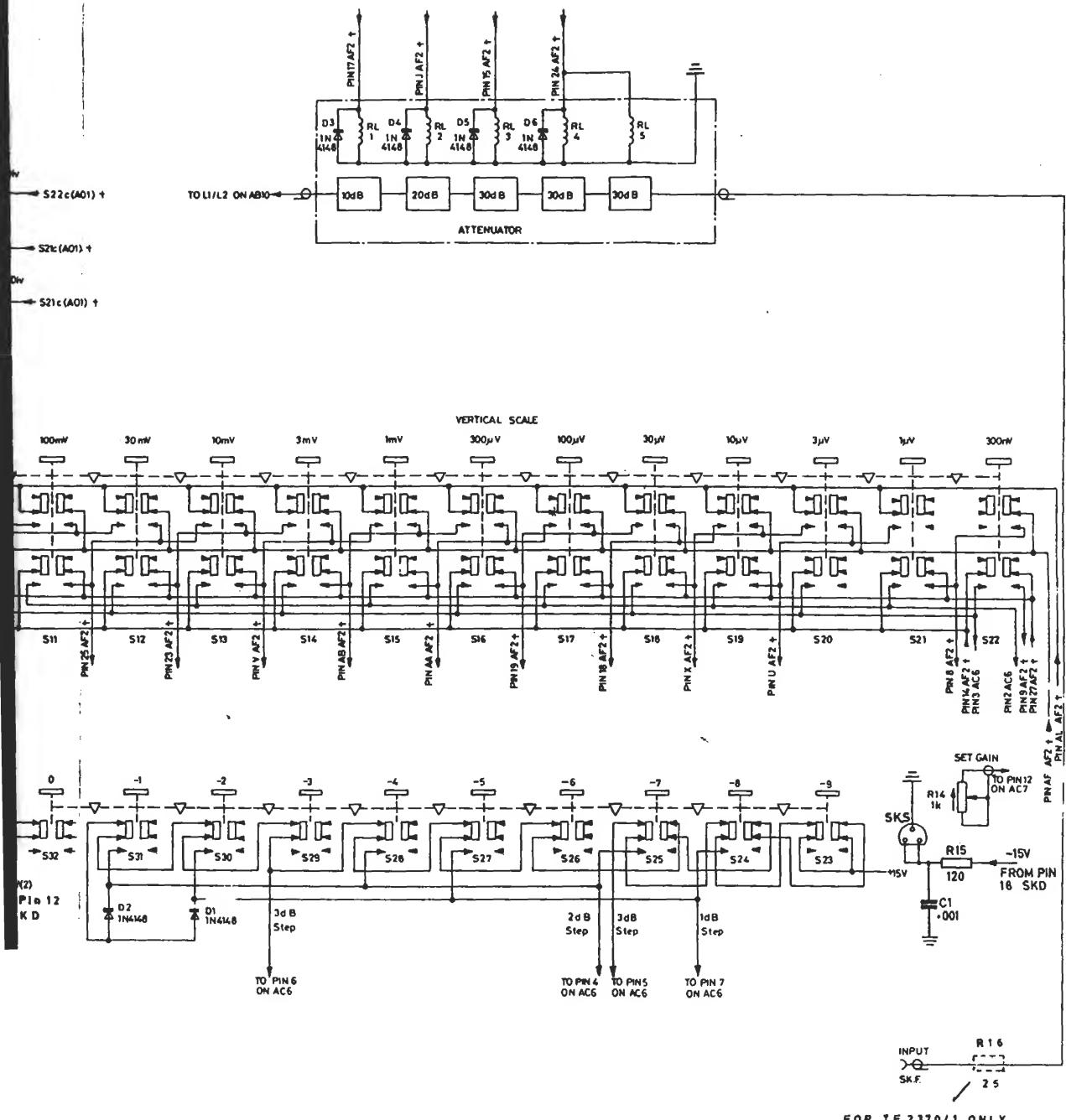
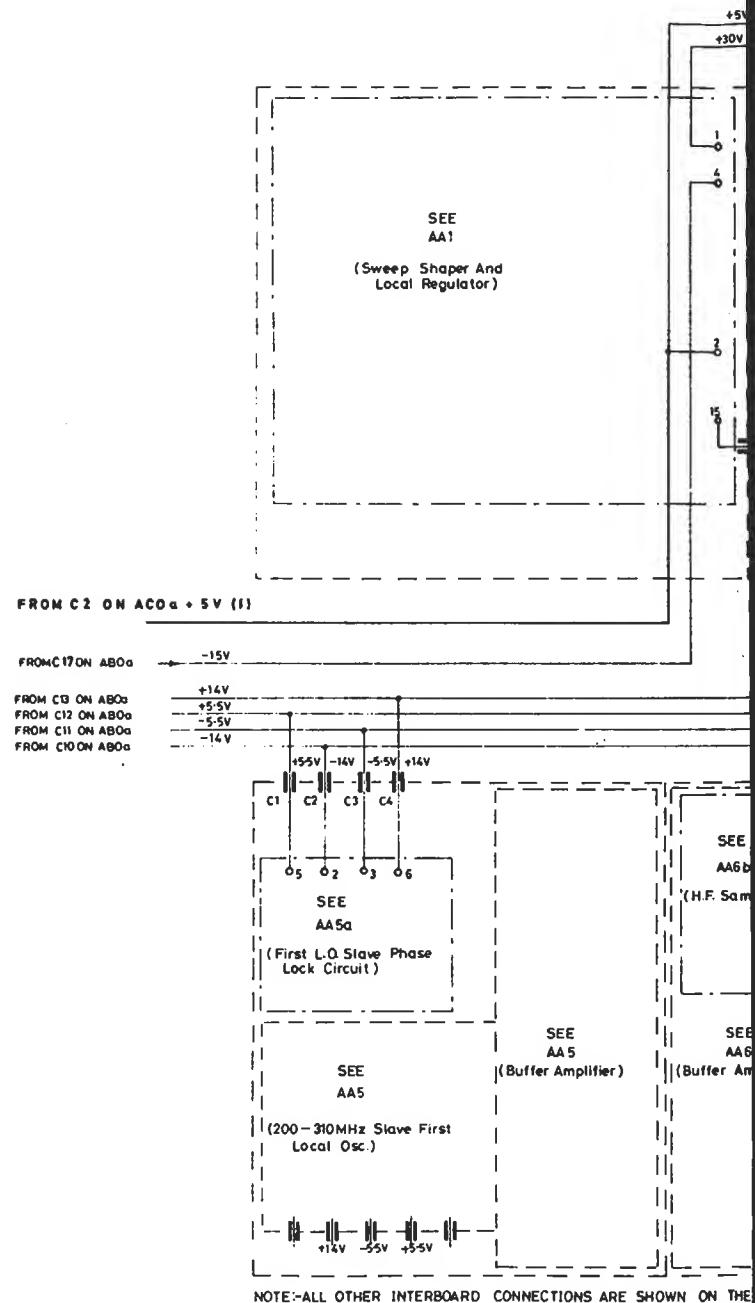


Fig. 7.3 Lower control panel A02



DRG N° Z 44990-064U ISSUE 7

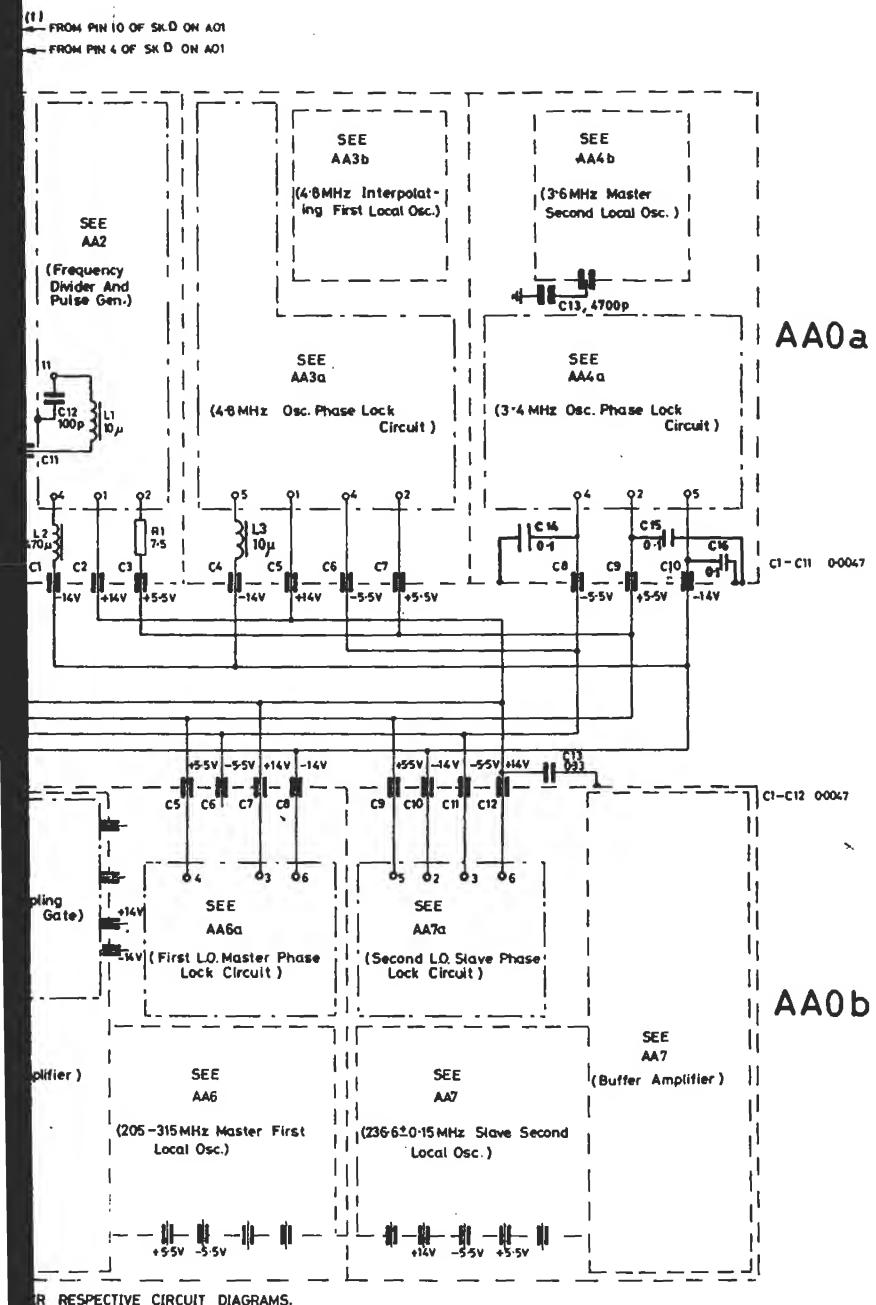
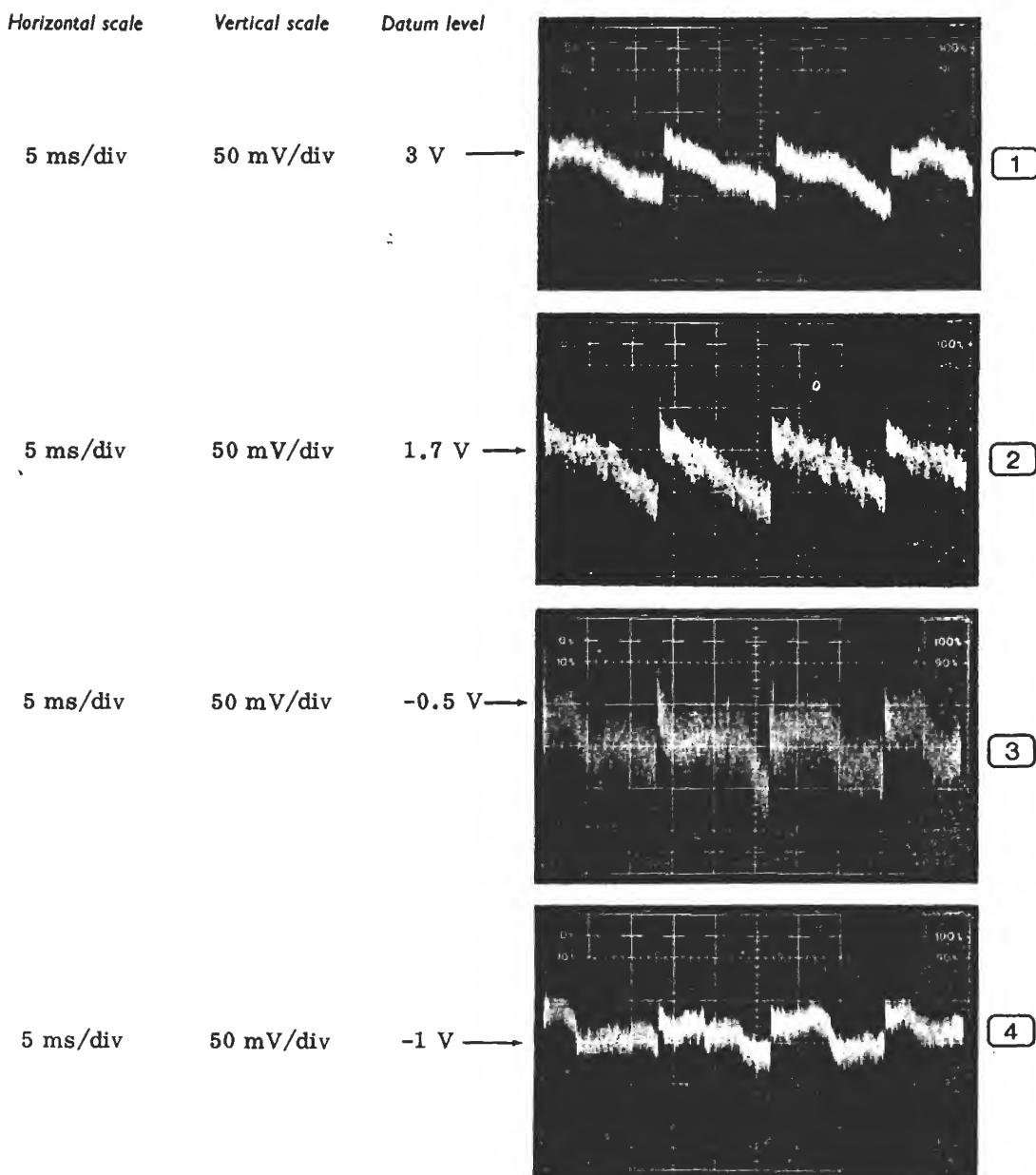
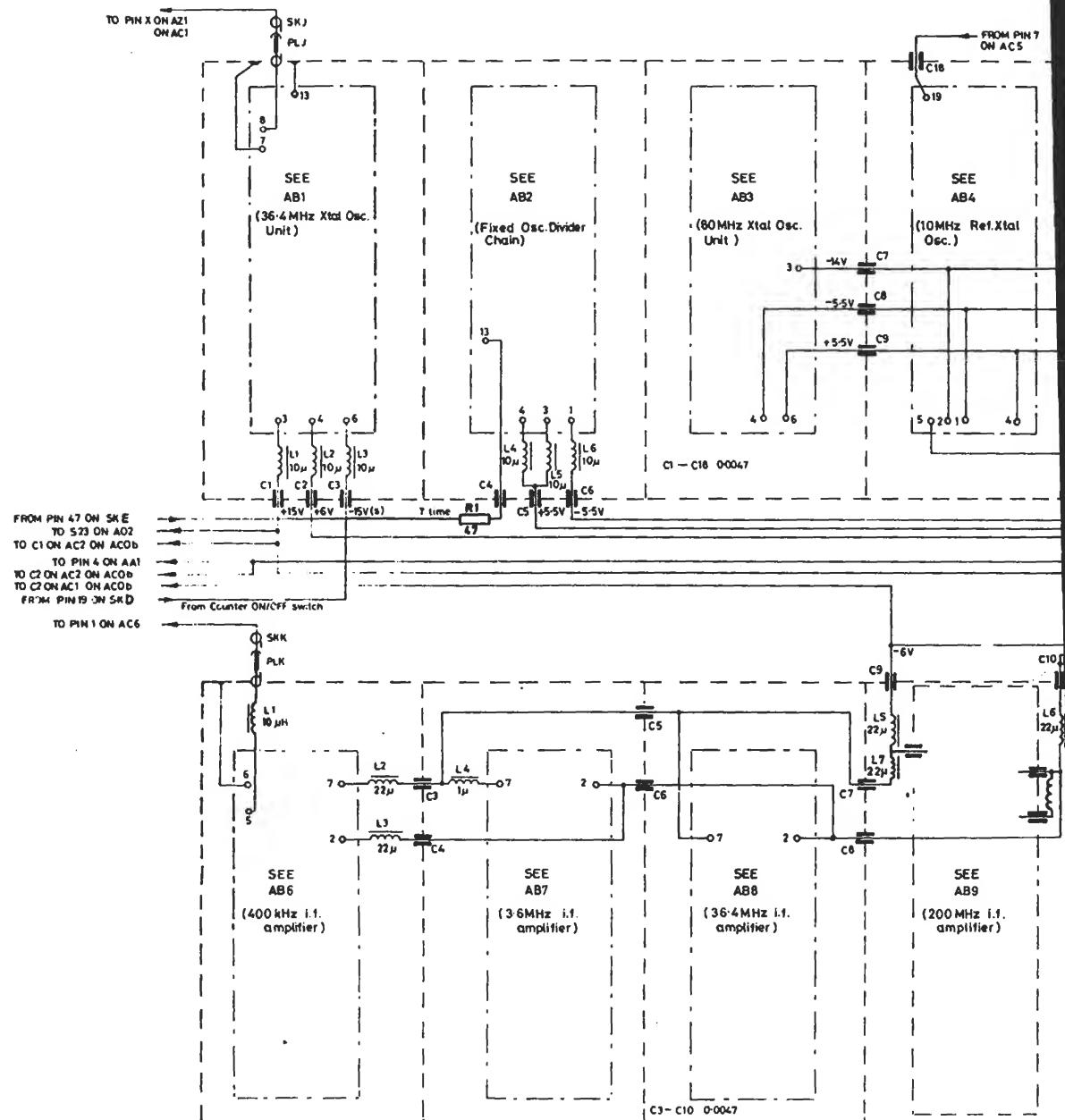


Fig. 7.4 AA tray Interconnections

### Waveforms for AB5

TF 2370 controls - HORIZONTAL SCALE and RANGE : 10 MHz/DIV  
FILTER BANDWIDTH : WIDE  
COUNTER ON/OFF : ON





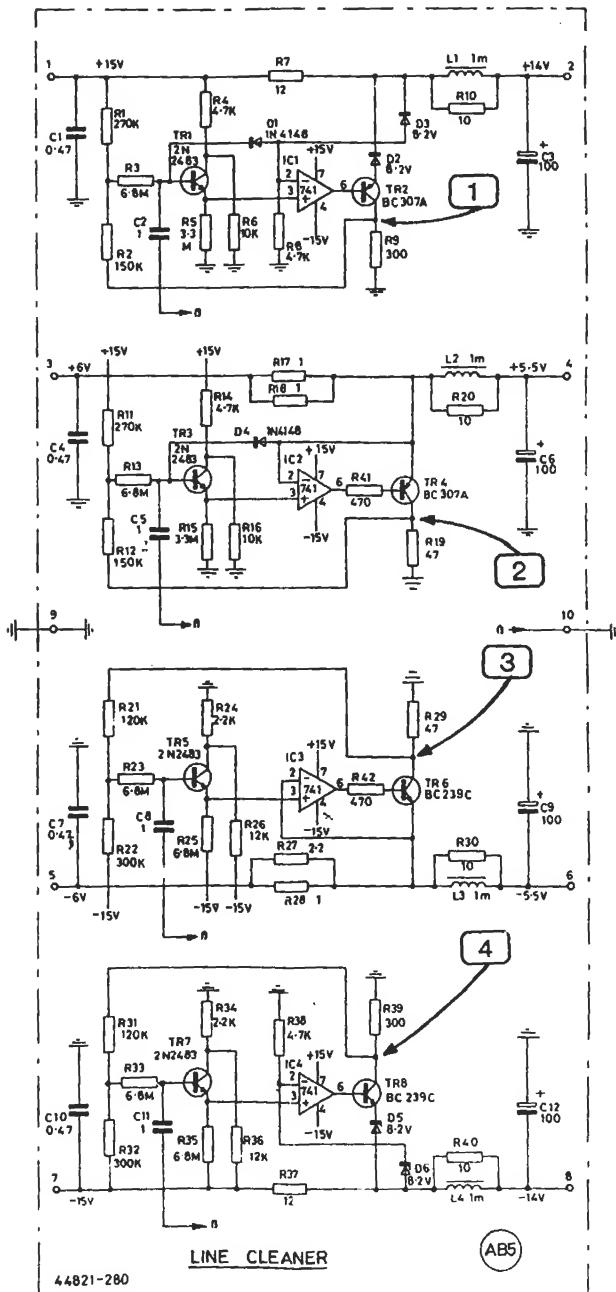
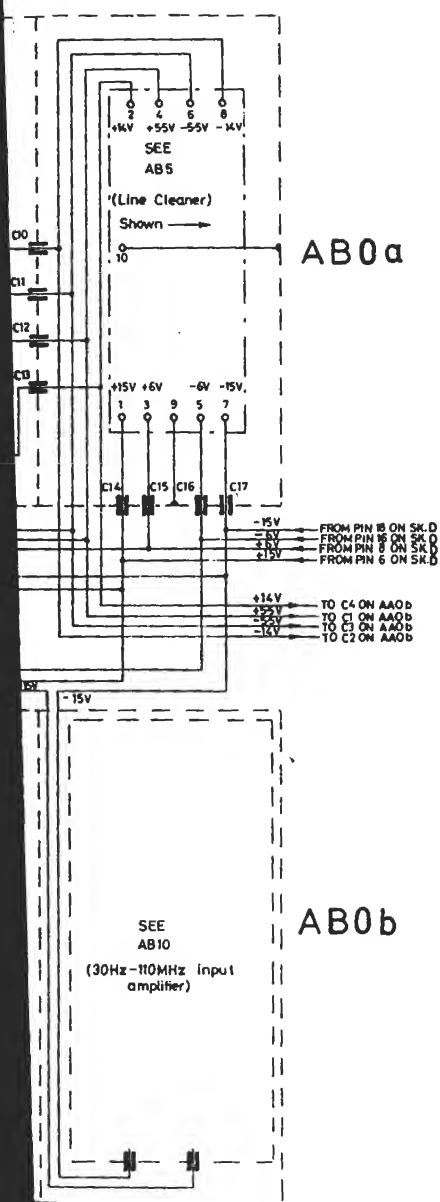
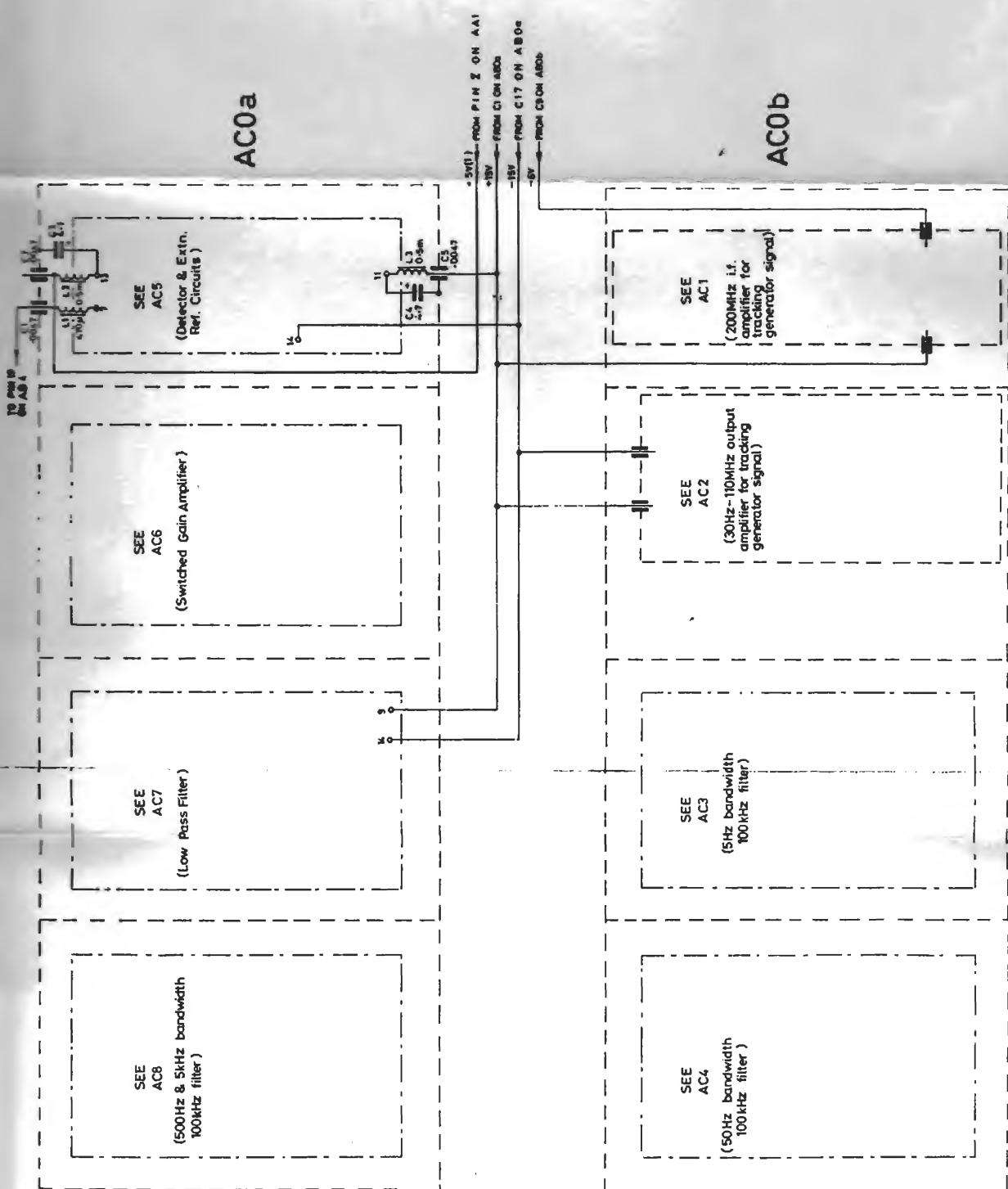
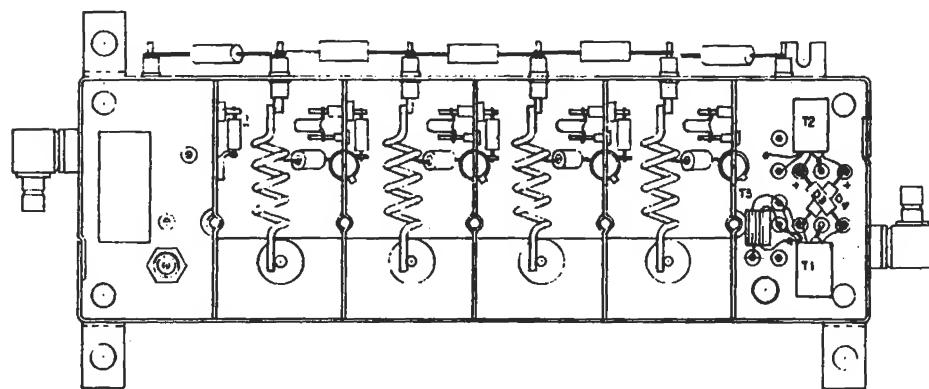
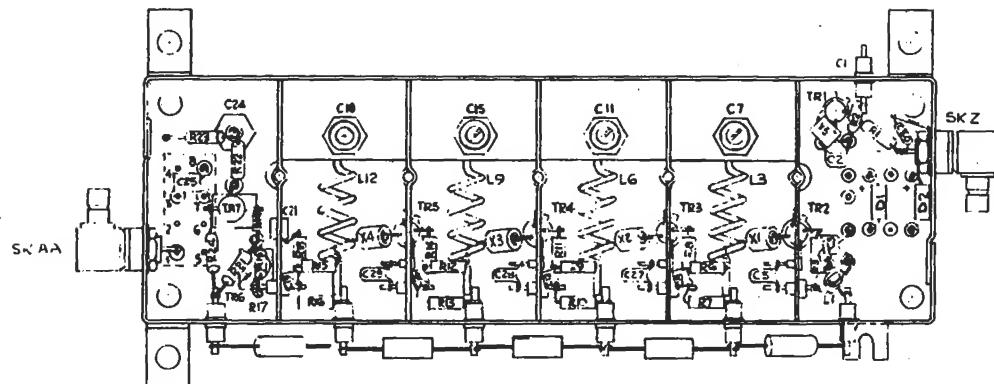


Fig. 7.5 AB tray interconnections and line cleaners ABS

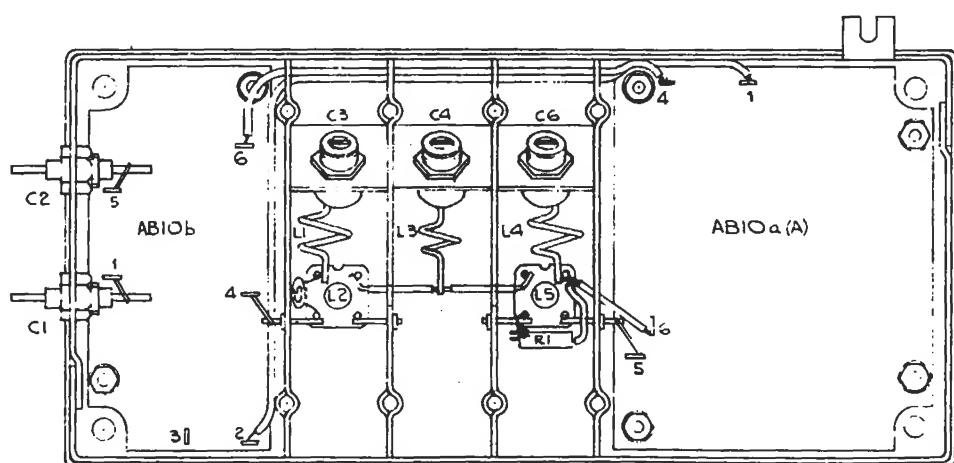


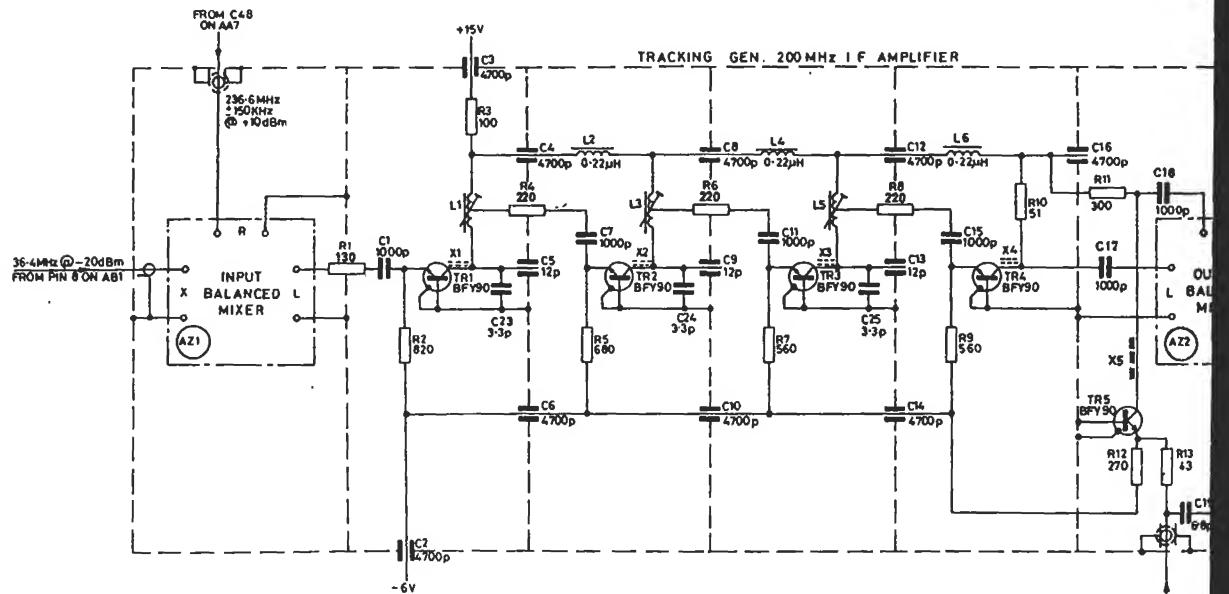
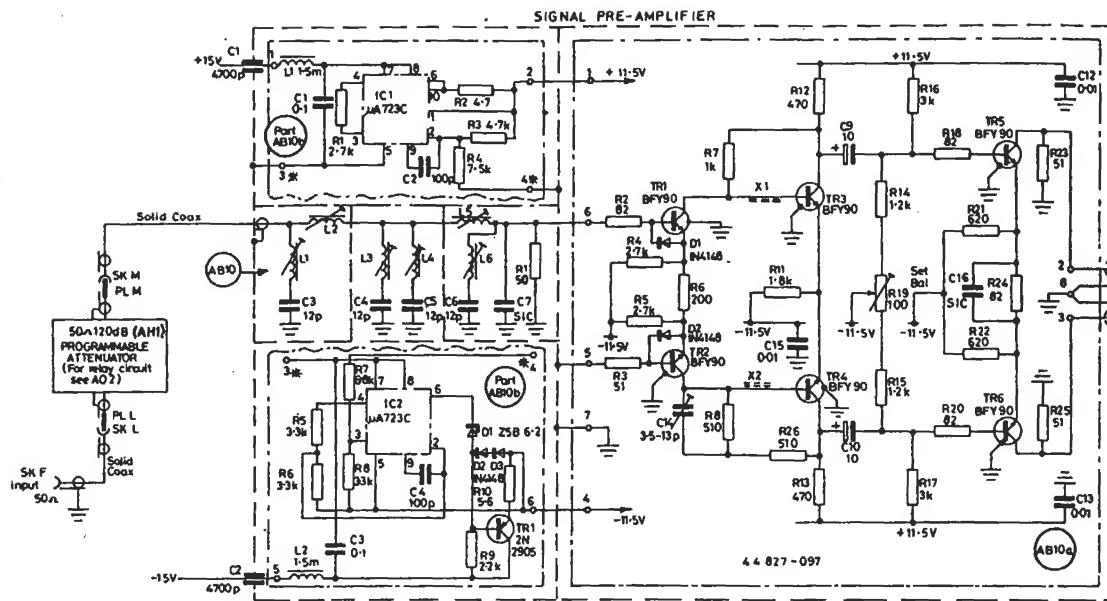
NOTE:-ALL OTHER INTER BOARD CONNECTIONS ARE SHOWN ON THEIR RESPECTIVE CIRCUIT DIAGRAMS

Layout of AB9



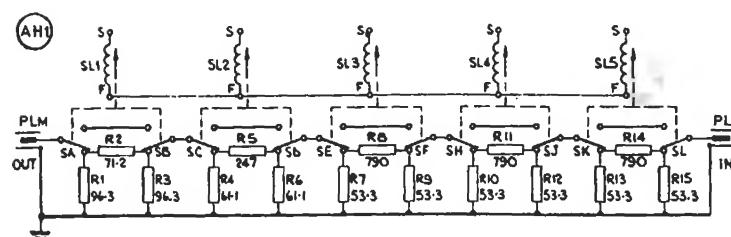
Layout of AB10 a





\* INDICATES LEAD ROUTED VIA REAR PANEL PL & SK  
SEE AO1 P1

DRG. No Z44990-034N ISSUE 13



NOTE: POSITION OF SWITCH SHOWN  
WHEN SOLENOIDS ARE UNENERGISED

NOTE: SOME SCREW CORES ARE SEALED  
WITH WAX AND IF ADJUSTMENT IS  
NEEDED, TO AVOID DAMAGE TO  
THE CORE, IT IS NECESSARY TO  
REMOVE THE WAX.

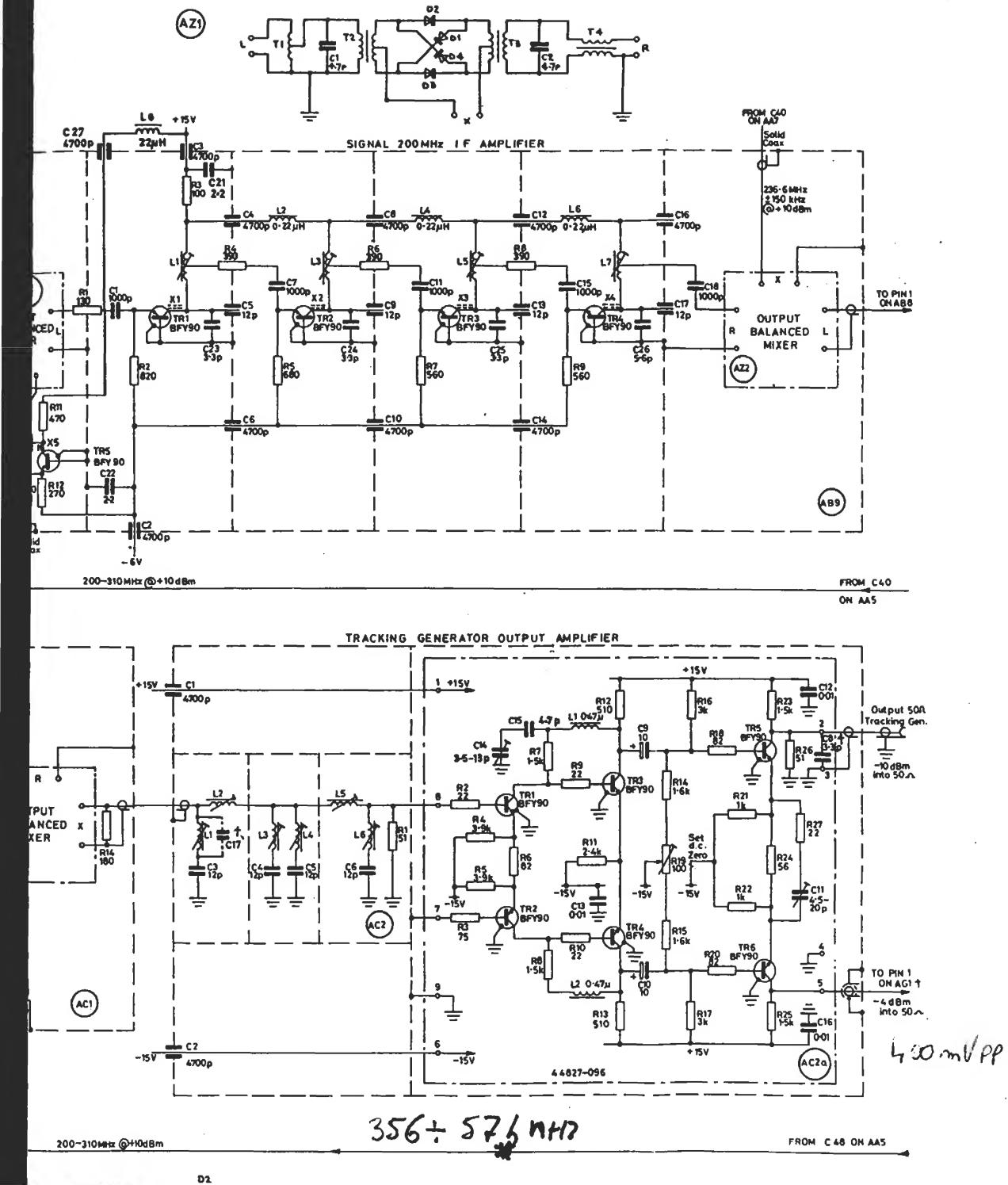
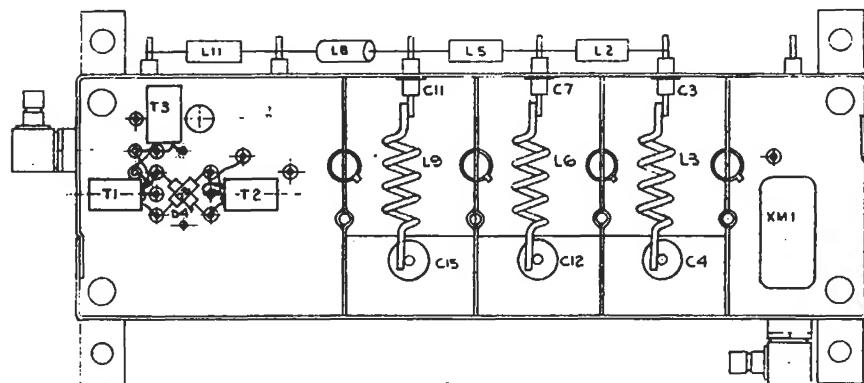
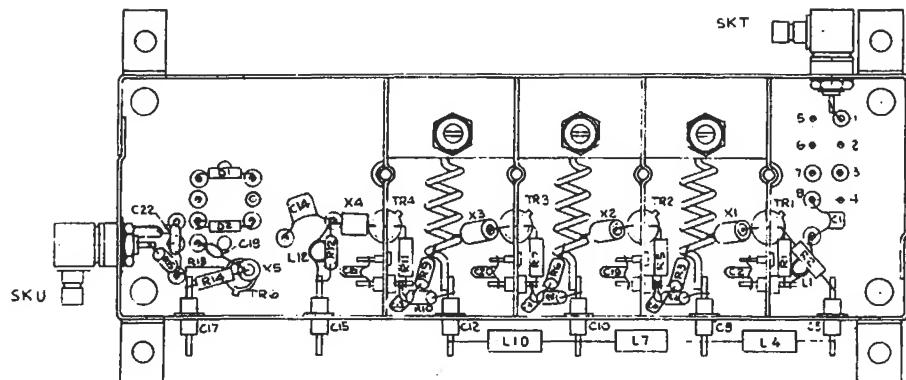
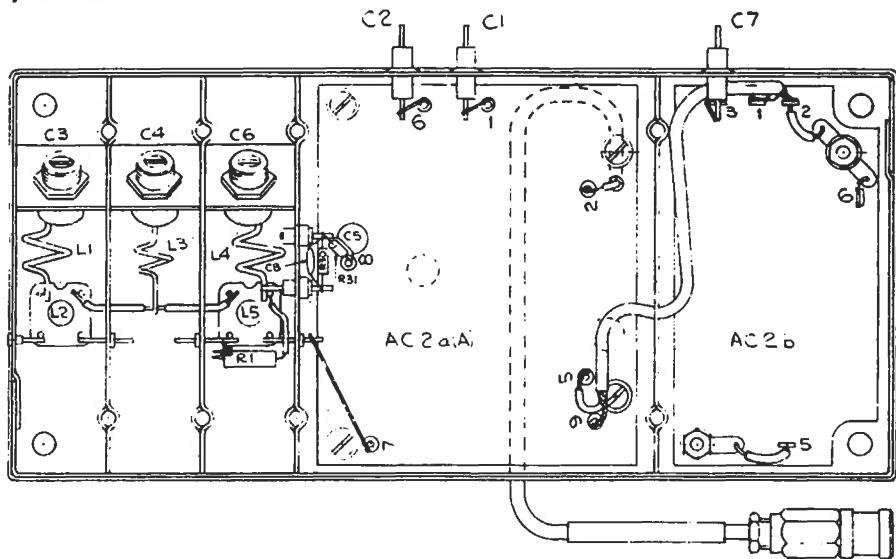


Fig. 7.7 Circuits: AB9, AB10, AC1, AC2 and AH1

### Layout of AC1



## Layout of AC2a



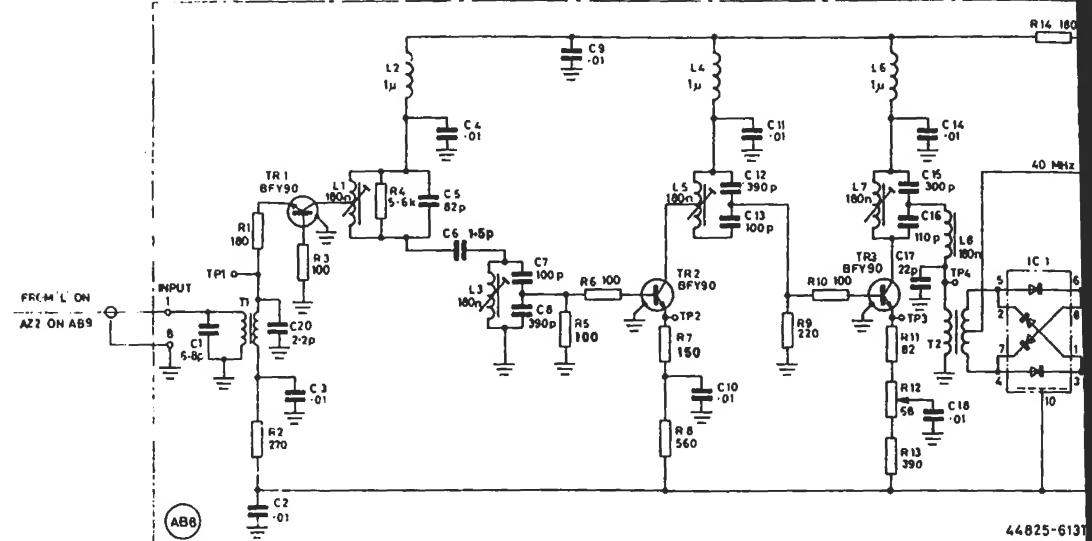
CALIBRATION TABLE

Valid for top of screen signal levels displayed on the  
10 dB/DIV position using MANUAL mode.

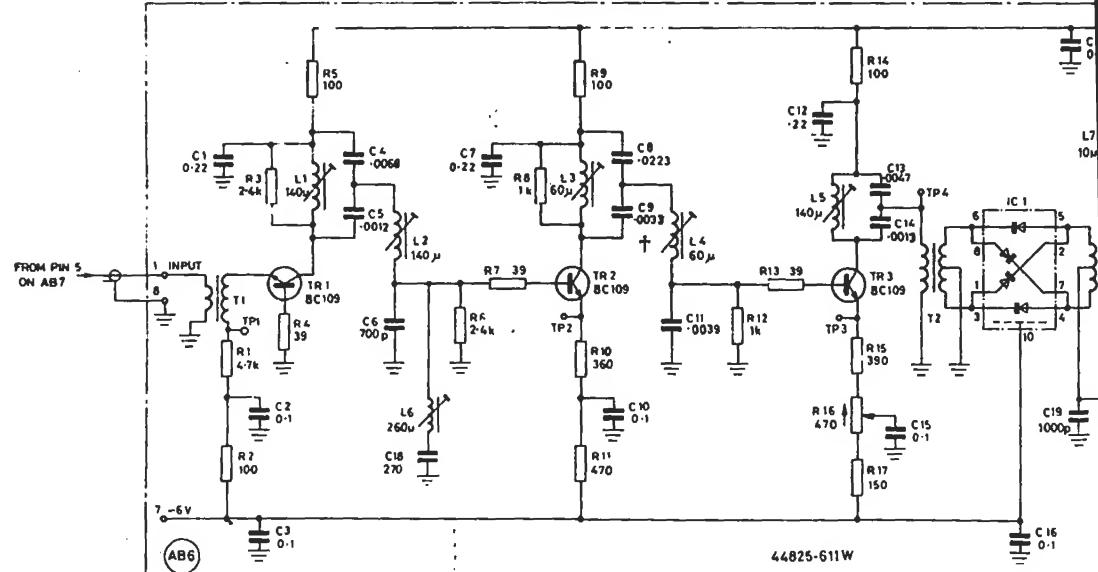
Input sensitivity for top of screen	Input attenuator setting	Signal level from attenuator	Input amp & 360 MHz i.f. amp gain	Signal level at pin 1 of AB8, AB7, AB6 & AC6°	Gain from pin 1 to TP2 on AC6	Signal level at TP2 on AC6°	Gain from TP2 to TP6 on AC6	Gain from TP6 on AC6 to pin 10 of AC7	Signal level at pin 32 on AD1°	DC level at pin 4 of AD2	Filter bandwidth selected		
+30 dBm	80dB	-50dBm	+13dB	-37dBm(9mV) -27dBm(28.5mV) -17dBm(90mV) -17dBm(90mV) -17dBm(90mV)	x7.1 (+17dB)	64mV	0dB	40dB	6.4V	+2V d.c.	5Hz		
	70dB	-40dBm		200mV		0dB	30dB	6.4V			50Hz		
	60dB	-30dBm		640mV		0dB	20dB				500Hz		
	60dB	-30dBm		640mV		10dB	10dB				5kHz		
	60dB	-30dBm		640mV		17dB	3dB				50kHz		
+20 dBm	70dB	-50dBm	+13dB	-37dBm(9mV) -27dBm(28.5mV) -17dBm(90mV) -17dBm(90mV) -17dBm(90mV)	x7.1 (+17dB)	64mV	0dB	40dB	6.4V	+2V d.c.	5Hz		
	60dB	-40dBm		200mV		0dB	30dB	50Hz					
	50dB	-30dBm		640mV		0dB	20dB	500Hz					
	50dB	-30dBm		640mV		10dB	10dB	5kHz					
	50dB	-30dBm		640mV		17dB	3dB	50kHz					
+10 dBm	60dB	-50dBm	+13dB	-37dBm(9mV) -27dBm(28.5mV) -17dBm(90mV) -17dBm(90mV) -17dBm(90mV)	x7.1 (+17dB)	64mV	0dB	40dB	6.4V	+2V d.c.	5Hz		
	50dB	-40dBm		200mV		0dB	30dB	50Hz					
	40dB	-30dBm		640mV		0dB	20dB	500Hz					
	40dB	-30dBm		640mV		10dB	10dB	5kHz					
	40dB	-30dBm		640mV		17dB	3dB	50kHz					
0 dBm	50dB	-50dBm	+13dB	-37dBm(9mV) -27dBm(28.5mV) -17dBm(90mV) -17dBm(90mV) -17dBm(90mV)	x7.1 (+17dB)	64mV	0dB	40dB	6.4V	+2V d.c.	5Hz		
	40dB	-40dBm		200mV		0dB	30dB	50Hz					
	30dB	-30dBm		640mV		0dB	20dB	500Hz					
	30dB	-30dBm		640mV		10dB	10dB	5kHz					
	30dB	-30dBm		640mV		17dB	3dB	50kHz					
-10 dBm	40dB	-50dBm	+13dB	-37dBm(9mV) -27dBm(28.5mV) -17dBm(90mV) -17dBm(90mV) -17dBm(90mV)	x7.1 (+17dB)	64mV	0dB	40dB	6.4V	+2V d.c.	5Hz		
	30dB	-40dBm		200mV		0dB	30dB	50Hz					
	20dB	-30dBm		640mV		0dB	20dB	500Hz					
	20dB	-30dBm		640mV		10dB	10dB	5kHz					
	20dB	-30dBm		640mV		17dB	3dB	50kHz					
-20 dBm	30dB	-50dBm	+13dB	-37dBm(9mV) -27dBm(28.5mV) -17dBm(90mV) -17dBm(90mV) -17dBm(90mV)	x7.1 (+17dB)	64mV	0dB	40dB	6.4V	+2V d.c.	5Hz		
	20dB	-40dBm		200mV		0dB	30dB	50Hz					
	10dB	-30dBm		640mV		0dB	20dB	500Hz					
	10dB	-30dBm		640mV		10dB	10dB	5kHz					
	10dB	-30dBm		640mV		17dB	3dB	50kHz					
-30 dBm	20dB	-50dBm	+13dB	-37dBm(9mV) -27dBm(28.5mV) -17dBm(90mV) -17dBm(90mV) -17dBm(90mV)	x7.1 (+17dB)	64mV	0dB	40dB	6.4V	+2V d.c.	5Hz		
	10dB	-40dBm		200mV		0dB	30dB	50Hz					
	0dB	-30dBm		640mV		0dB	20dB	500Hz					
	0dB	-30dBm		640mV		10dB	10dB	5kHz					
	0dB	-30dBm		640mV		17dB	3dB	50kHz					
-40 dBm	10dB	-50dBm	+13dB	-37dBm(9mV) -27dBm(28.5mV) -27dBm(28.5mV) -27dBm(28.5mV) -27dBm(28.5mV)	x7.1 (+17dB)	64mV	0dB	40dB	6.4V	+2V d.c.	5Hz		
	0dB	-40dBm		200mV		0dB	30dB	50Hz					
	0dB	-40dBm		200mV		10dB	20dB	500Hz					
	0dB	-40dBm		200mV		20dB	10dB	5kHz					
	0dB	-40dBm		200mV		27dB	3dB	50kHz					
-50	0dB	-50dBm	+13dB	-37dBm(9mV) -37dBm(9mV) -37dBm(9mV) -37dBm(9mV) -37dBm(9mV)	x7.1 (+17dB)	64mV	0dB	40dB	6.4V	+2V d.c.	5Hz		
	0dB	-50dBm		64mV		10dB	30dB	50Hz					
	0dB	-50dBm		64mV		20dB	20dB	500Hz					
	0dB	-50dBm		64mV		30dB	10dB	5kHz					
	0dB	-50dBm		64mV		37dB	3dB	50kHz					

\* Voltages are peak to peak values

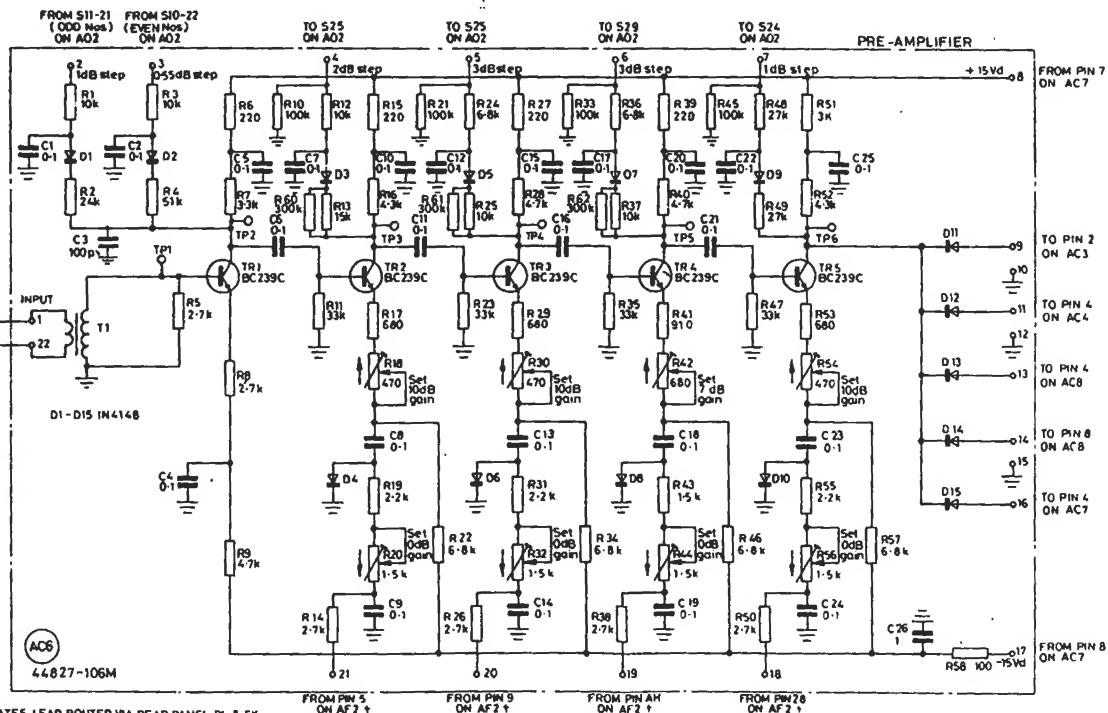
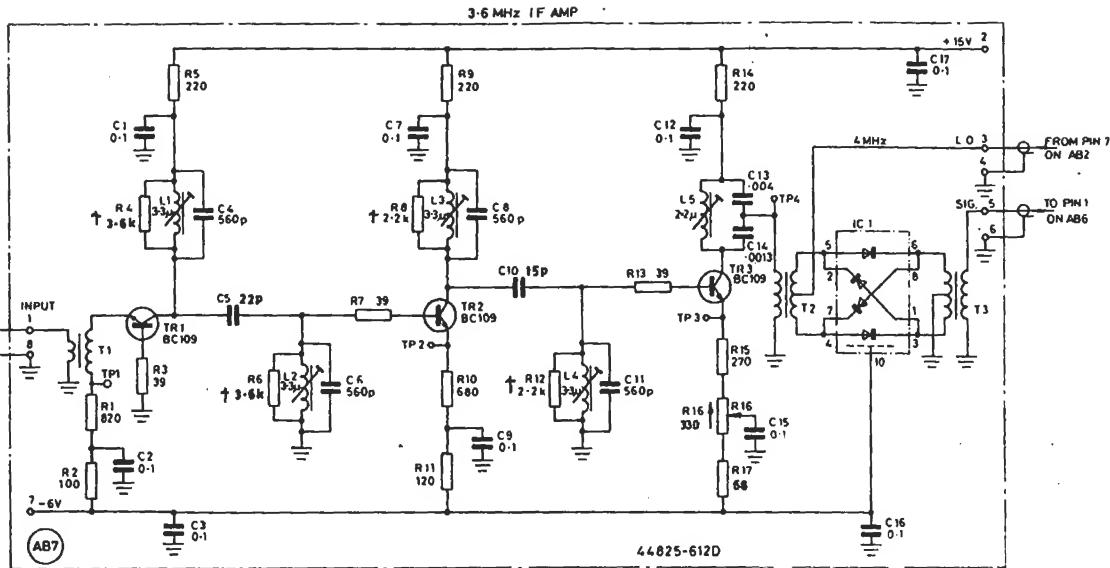
36.4 MHz IF AMP



400 kHz IF AMP



DRG N° Z44825-611W ISSUE 10

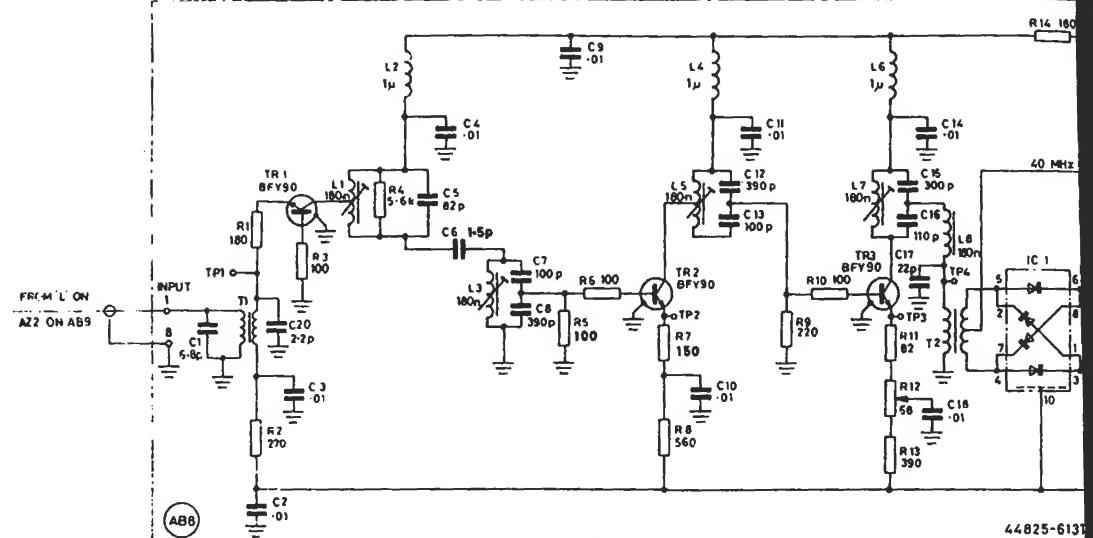


† INDICATES LEAD ROUTED VIA REAR PANEL PL & SK  
SEE AO1 PT 1

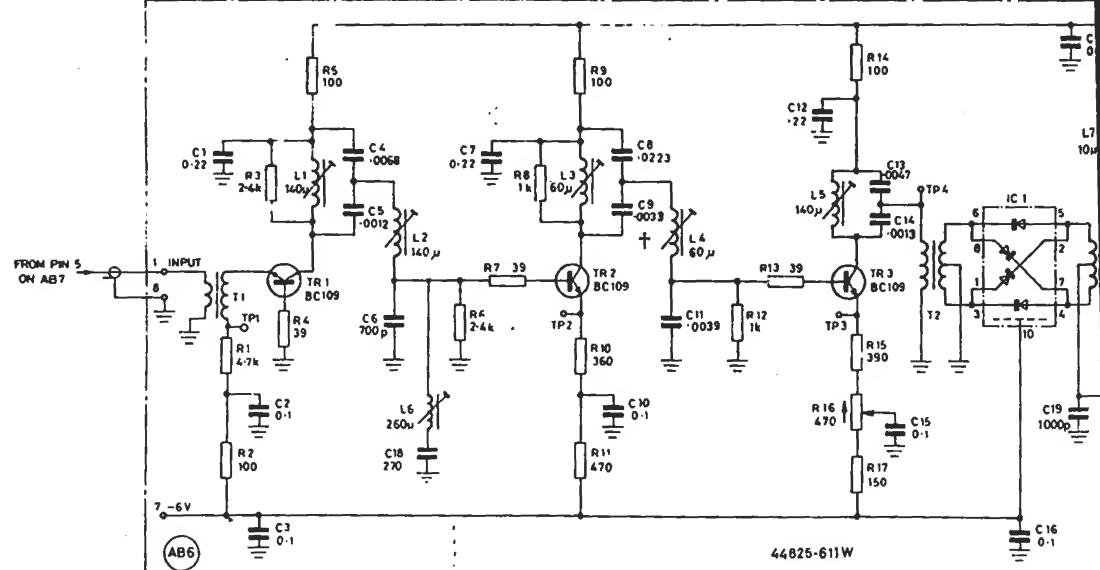
NOTE : SOME SCREW CORES ARE SEALED WITH  
WAX AND IF ADJUSTMENT IS NEEDED,  
TO AVOID DAMAGE TO THE CORE, IT  
IS NECESSARY TO REMOVE THE WAX.

Fig. 7.8 Circuits: AC6, AB6, AB7 and AB8

36.4 MHz IF AMP



400 kHz IF AMP



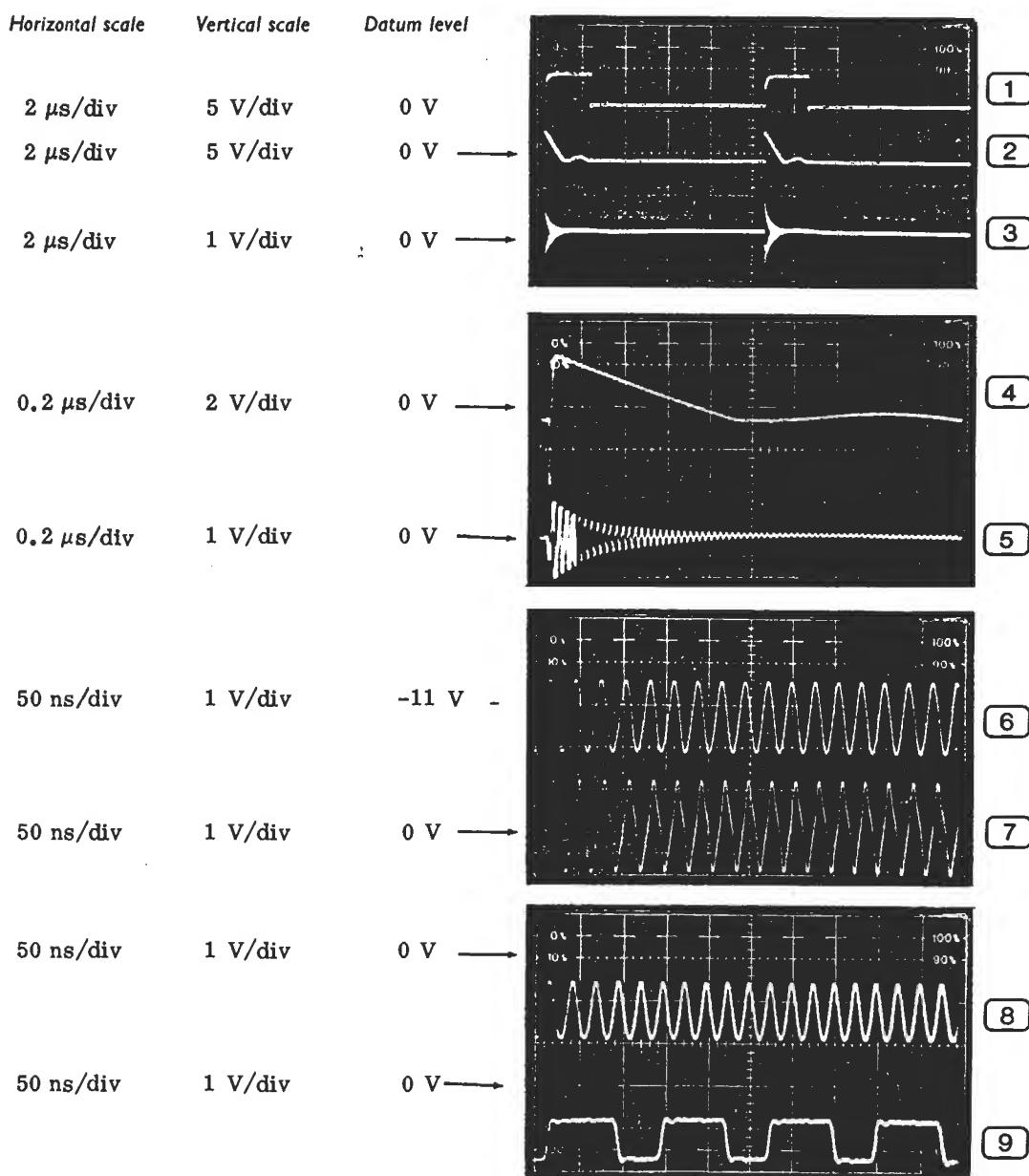
DRG N° Z44825-611W ISSUE 10

## Waveforms for AB1, AB2, AB3 and AB4

**Note** Probe connections and earth leads should be as short as possible.

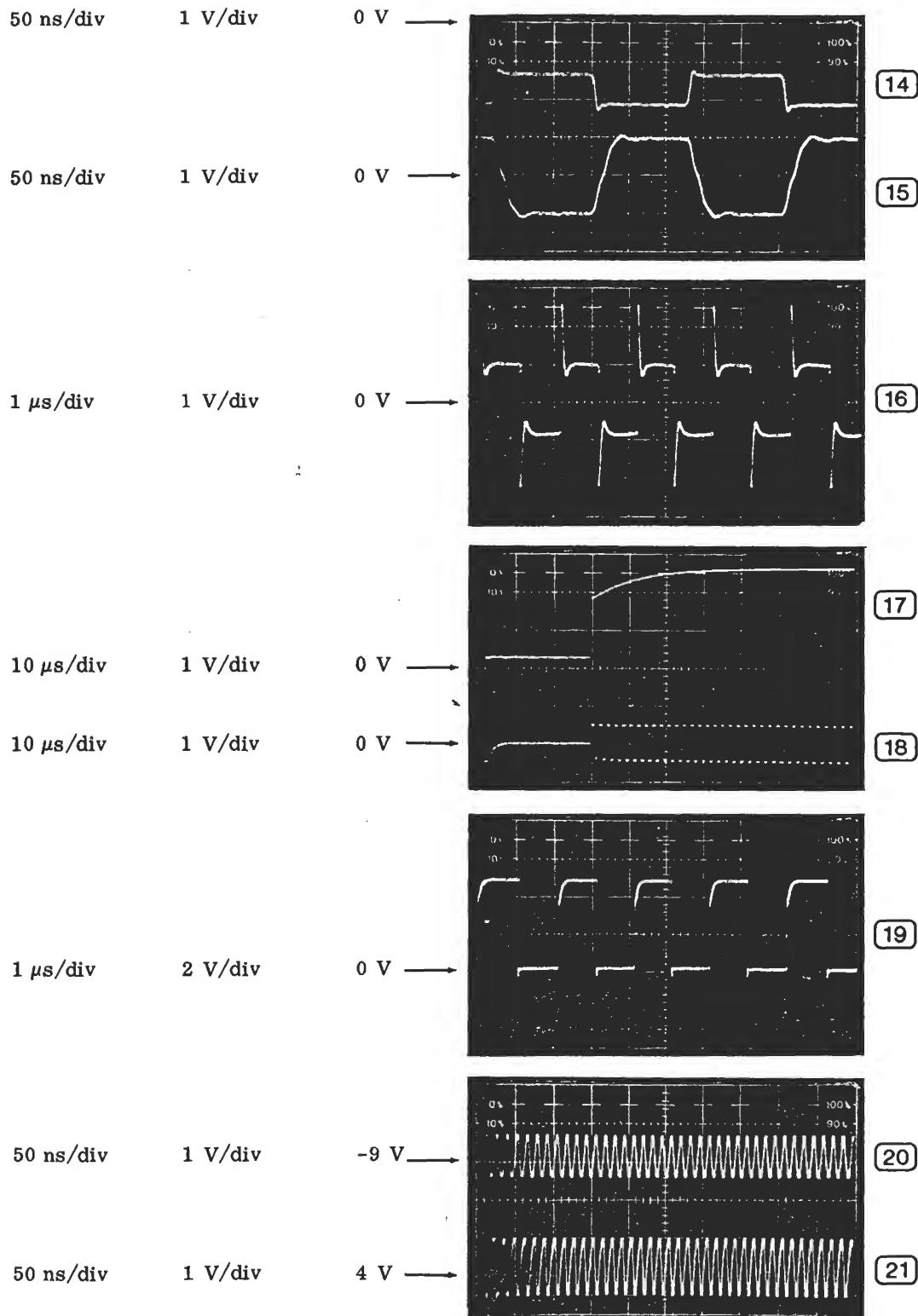
TF 2370 controls - HORIZONTAL SCALE and RANGE : 10 MHz/DIV  
FILTER BANDWIDTH : WIDE

For (27), feed a 1 MHz 1 V p-p signal to the EXTERNAL STANDARD INPUT.  
Oscilloscope triggering - (2) to (5) from (1) (a.c. positive)  
(10) to (13) from (14) (a.c. positive)

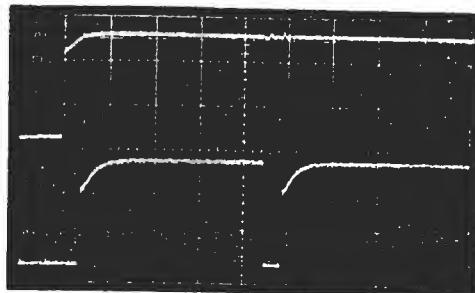


10  
11  
12  
13

NOT  
USED

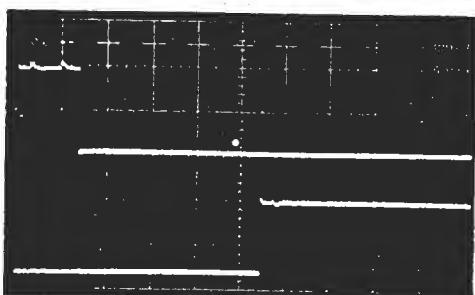


5  $\mu$ s/div 2 V/div



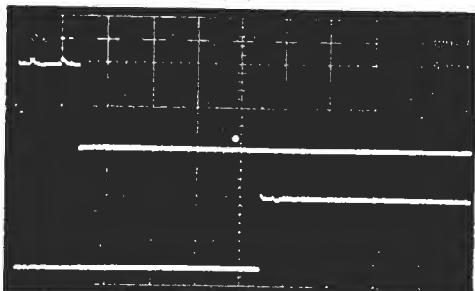
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5  $\mu$ s/div 2 V/div



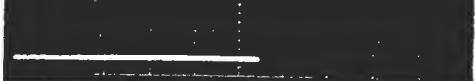
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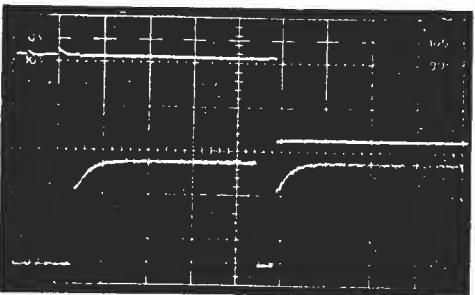
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5  $\mu$ s/div 2 V/div



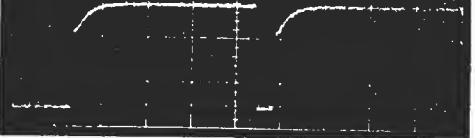
20

5  $\mu$ s/div 2 V/div



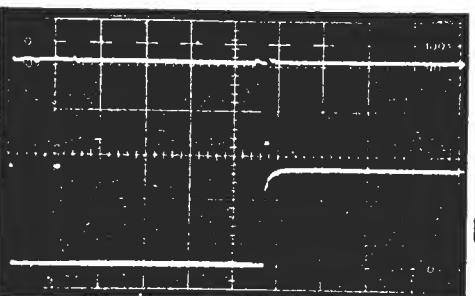
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5  $\mu$ s/div 2 V/div



22

5  $\mu$ s/div 2 V/div



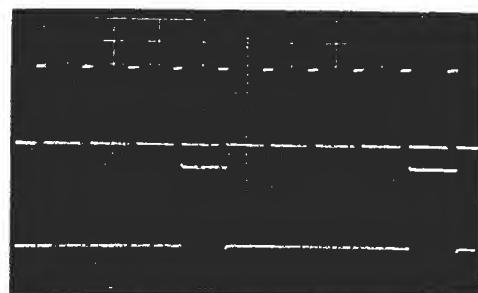
23

5  $\mu$ s/div 2 V/div

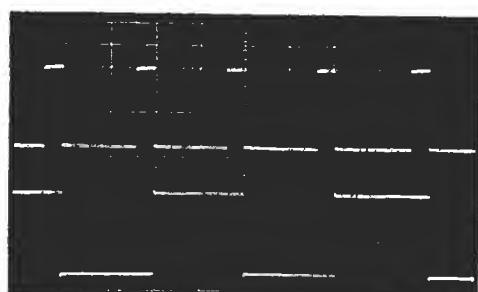


24

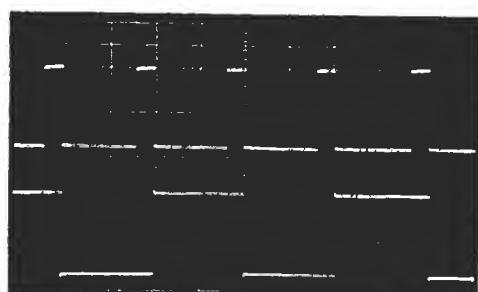
0.2 ms/div      2 V/div



0.2 ms/div      2 V/div



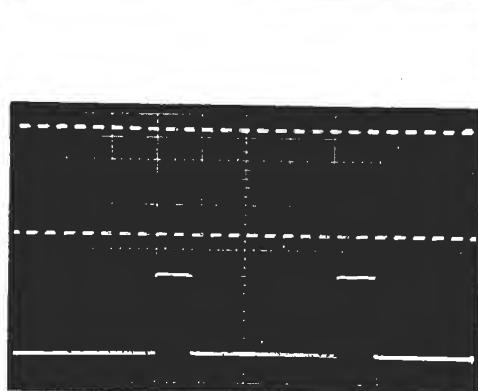
0.5 ms/div      2 V/div



0.5 ms/div      2 V/div



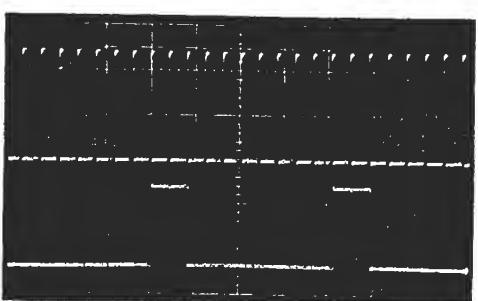
5 ms/div      }  
50 ms/div      }  
0.5 s/div      }  
50  $\mu$ s/div      }  
0.5 ms/div      } 2 V/div



5 ms/div      }  
50 ms/div      }  
0.5 s/div      }  
50  $\mu$ s/div      }  
0.5 ms/div      } 2 V/div



5  $\mu$ s/div      2 V/div



10  $\mu$ s/div      2 V/div



8

9

10

11

12

13

14

15

16

17

18

19

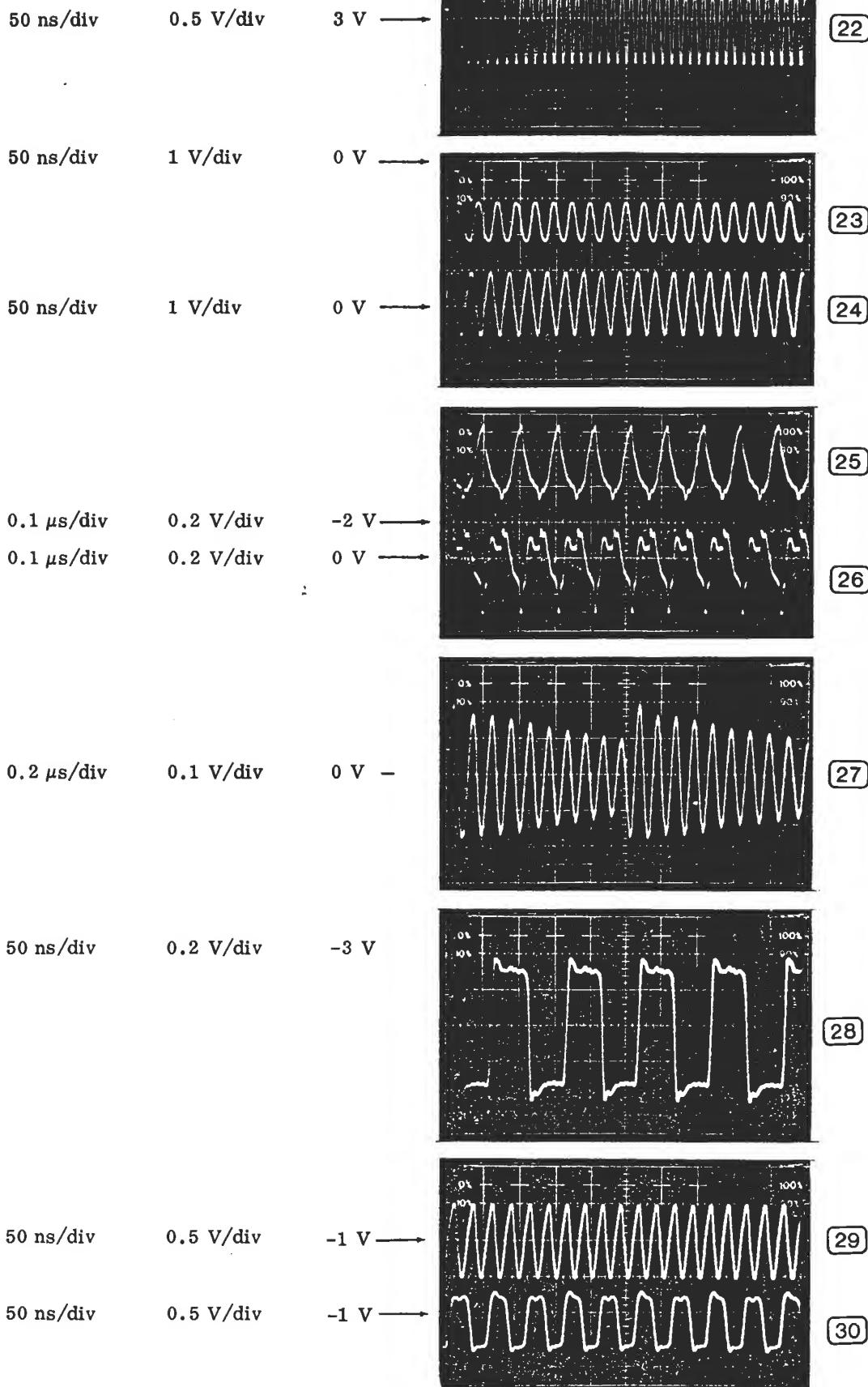
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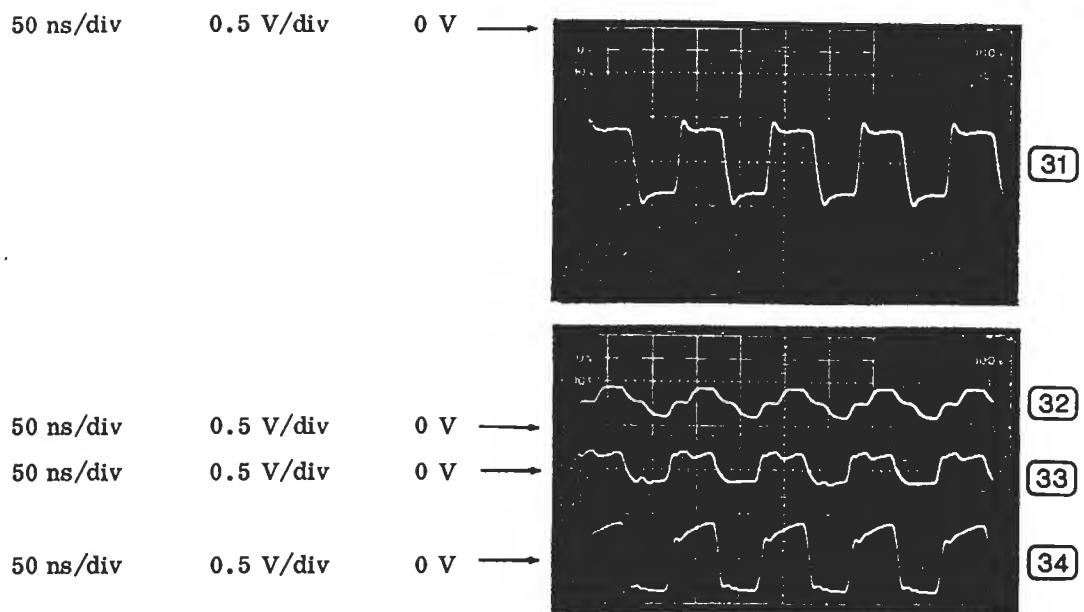
21

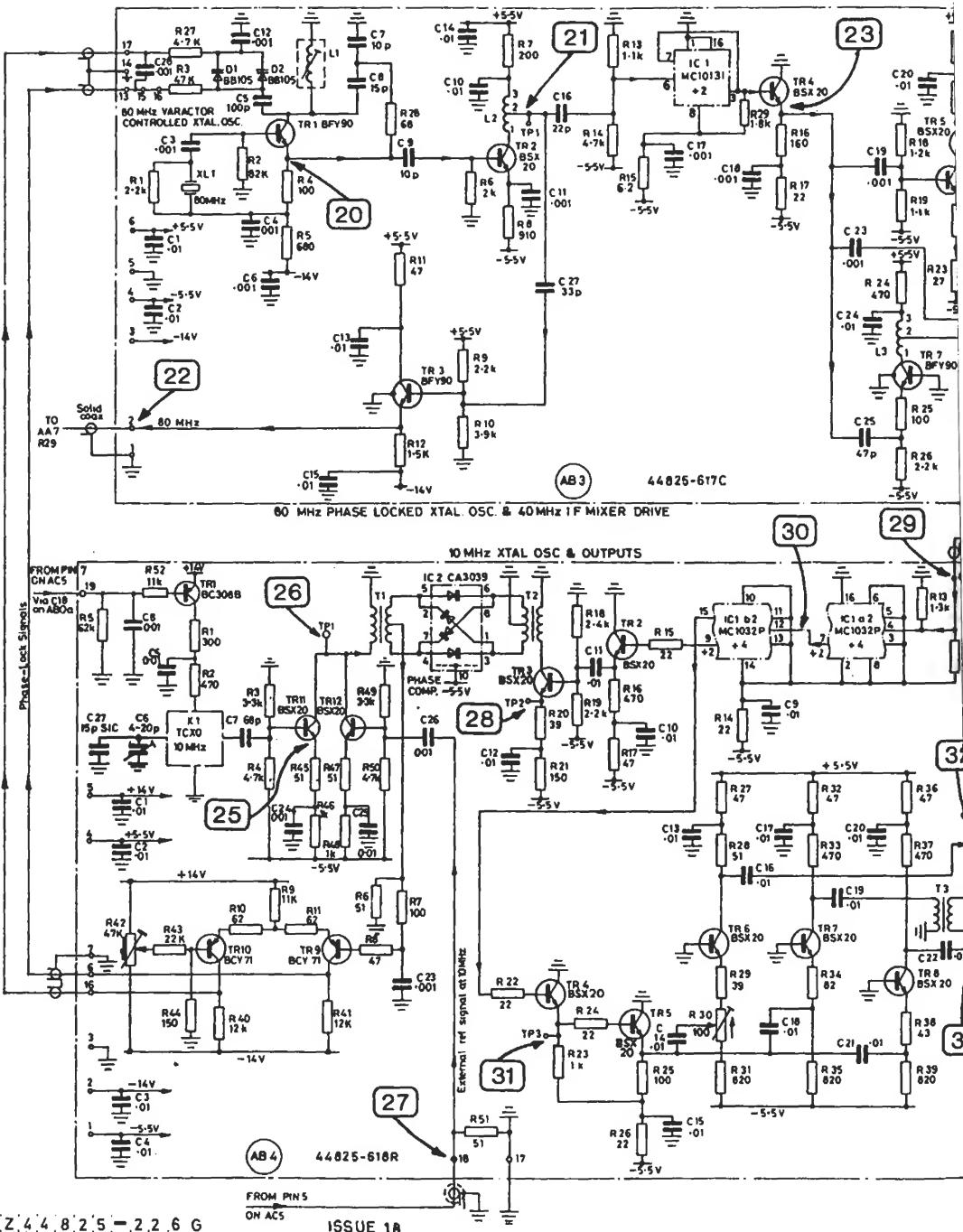
22

23

NOT  
USED







NOTE : SOME SCREW CORES ARE SEALED WITH WAX AND IF ADJUSTMENT NEEDED, TO AVOID DAMAGE TO THE CORE, IT IS NECESSARY TO REMOVE THE WAX.

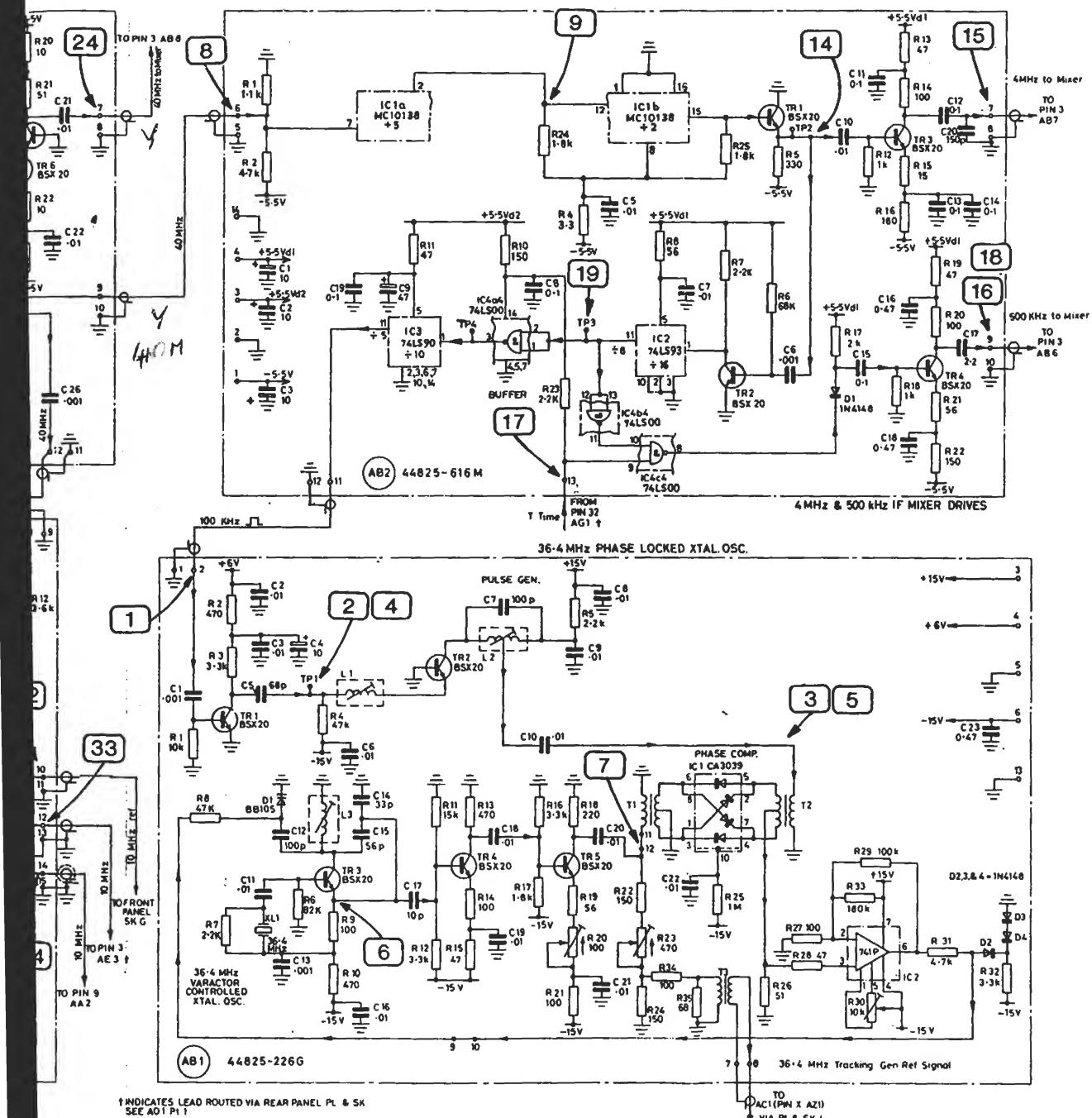


Fig. 7.9 Circuits: AB1, AB2, AB3 and AB4

## Waveforms for AA1

**Note** Probe connections and earth leads should be as short as possible.

TF 2370 controls - SWEEP MODE : AUTO

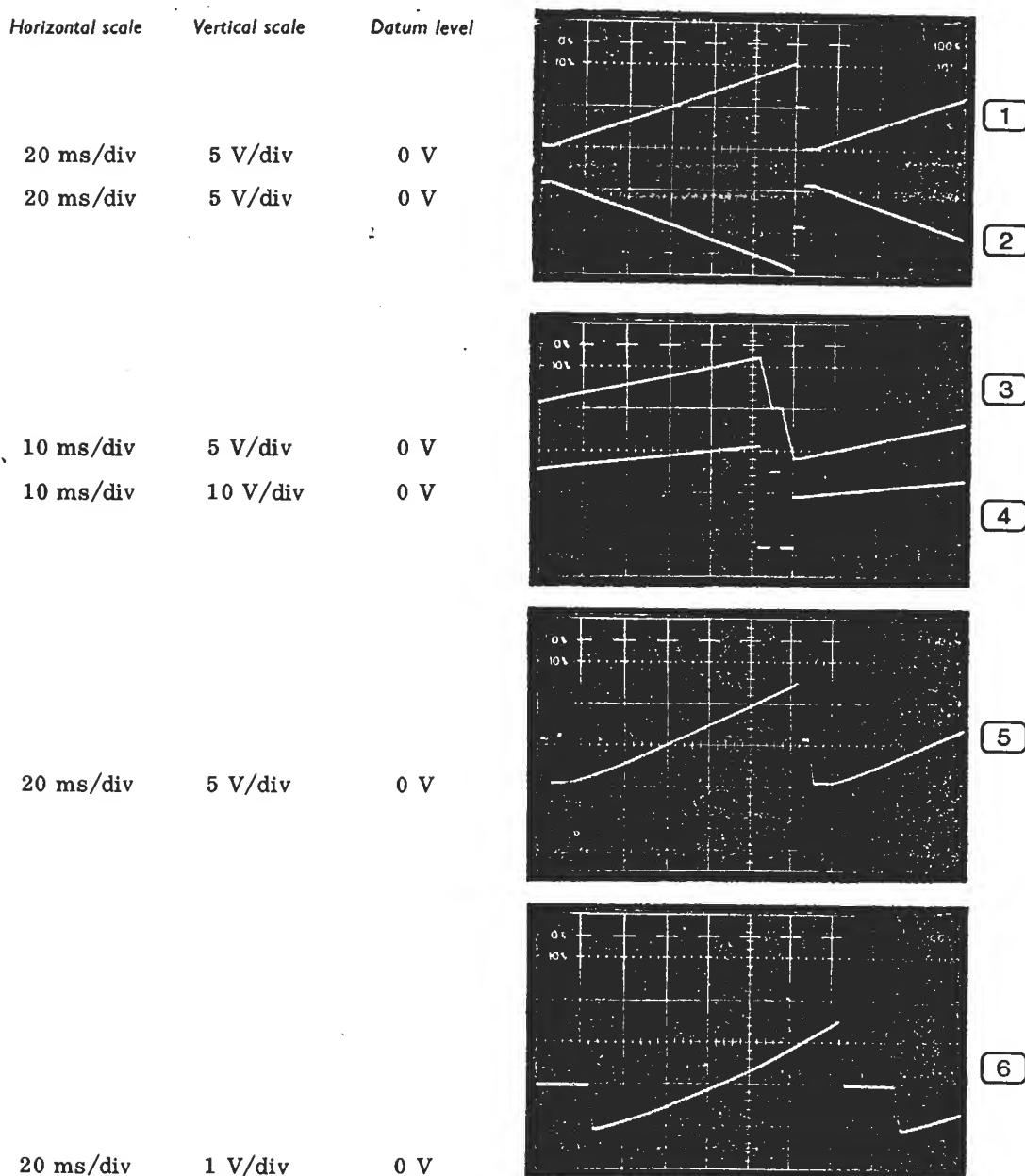
HORIZONTAL SCALE and RANGE : (1) to (5) 10 MHz/DIV  
(6) 10 kHz/DIV

FILTER BANDWIDTH : WIDE

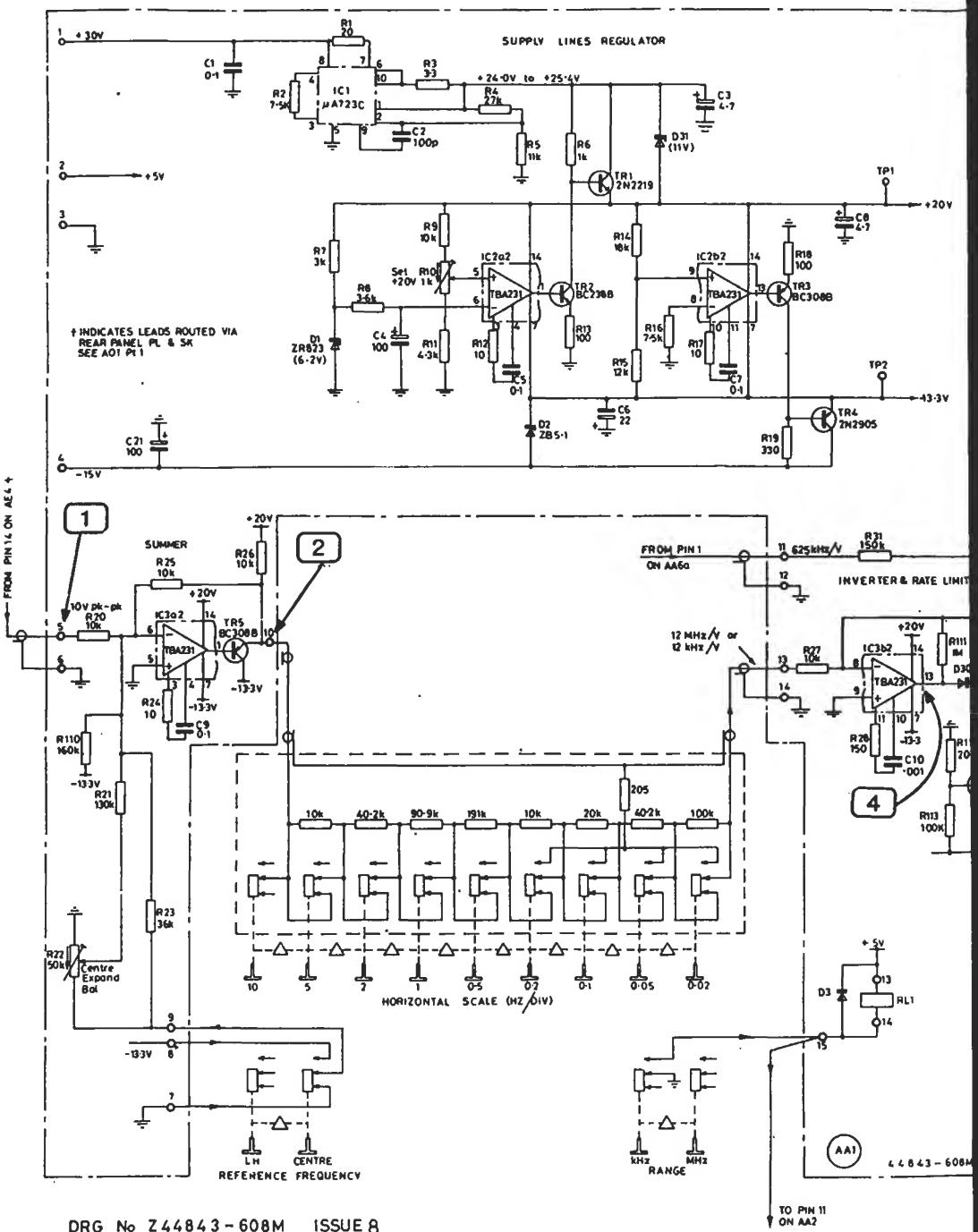
REFERENCE FREQUENCY : (1) to (5) LH  
(6) CENTRE

REFERENCE FREQUENCY 0-110 MHz : Fully counter-clockwise

REFERENCE FREQUENCY  $\pm 70$  kHz : Fully counter-clockwise



kwise  
ise



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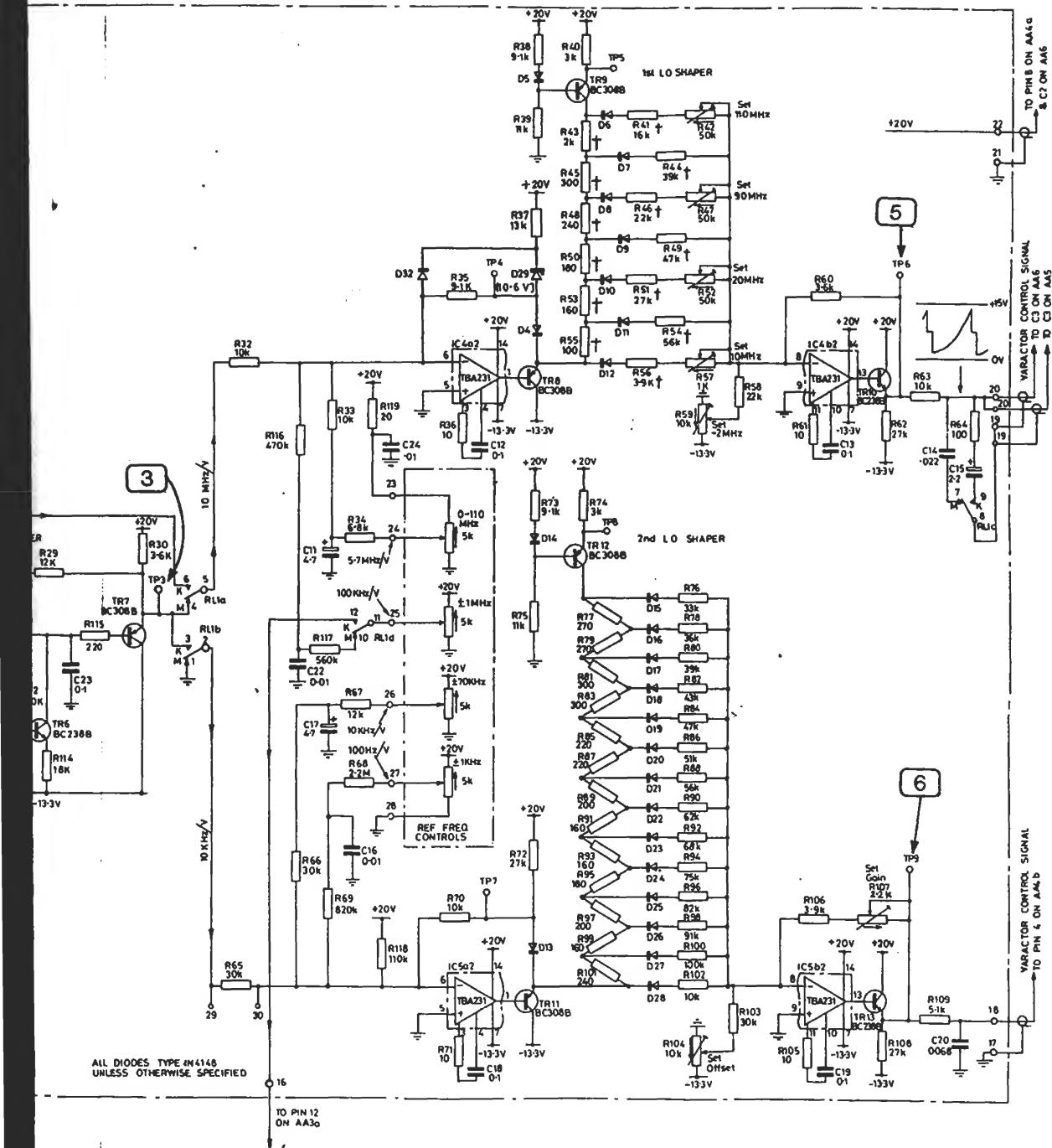
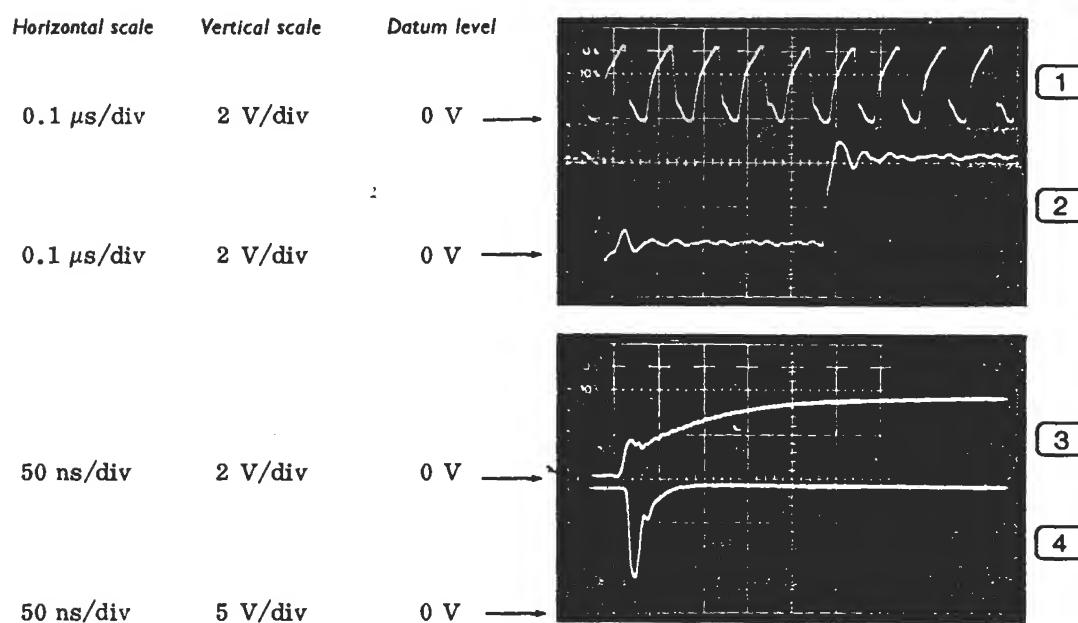


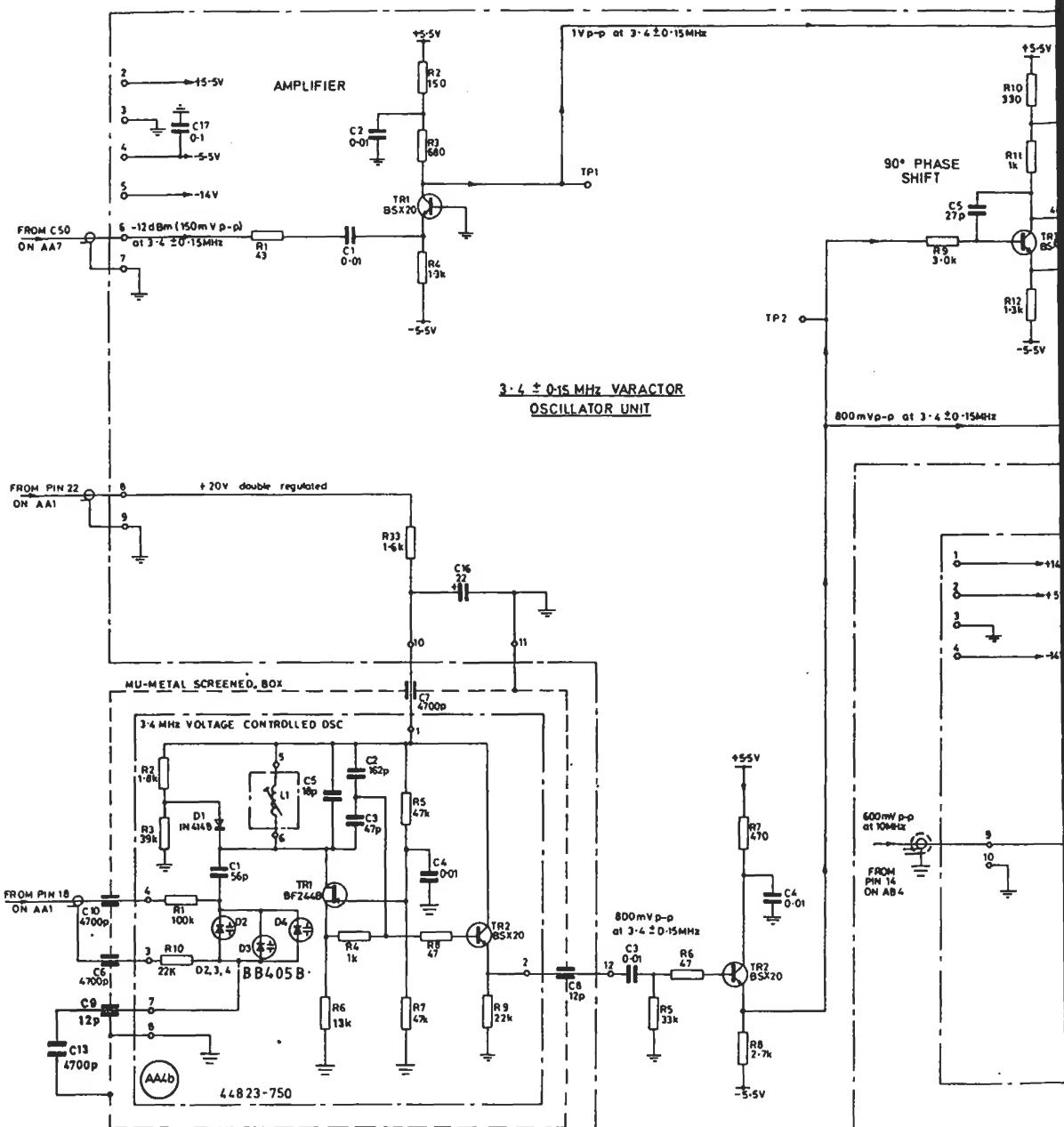
Fig. 7.10 Sweep shaper and local regulator AA1

## Waveforms for AA2 and AA4

**Note** Probe connections and earth leads should be as short as possible.

TF 2370 controls - **SWEET MODE : AUTO**  
**HORIZONTAL SCALE and RANGE : 10 MHz/DIV**  
**FILTER BANDWIDTH : WIDE**





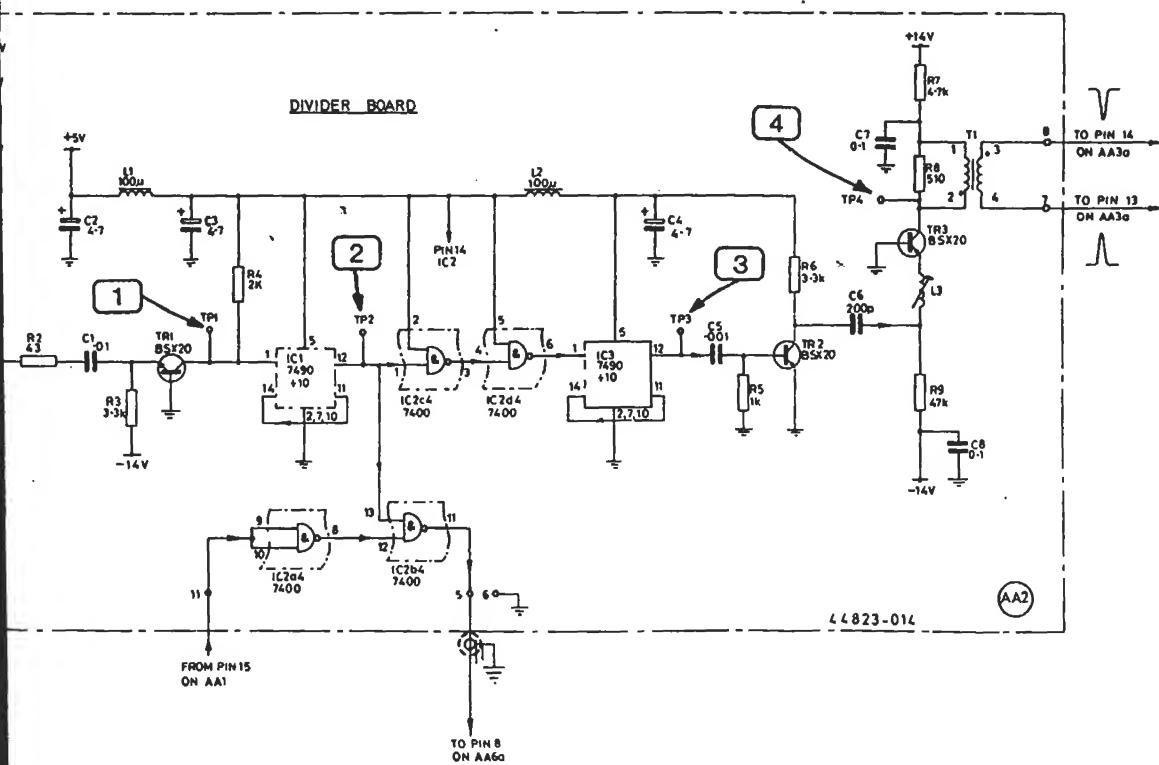
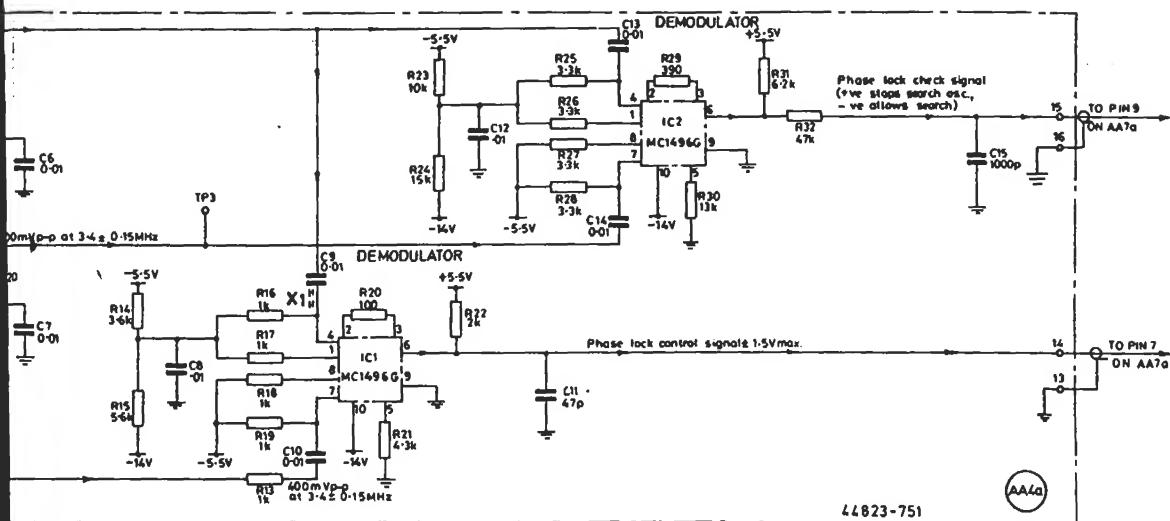


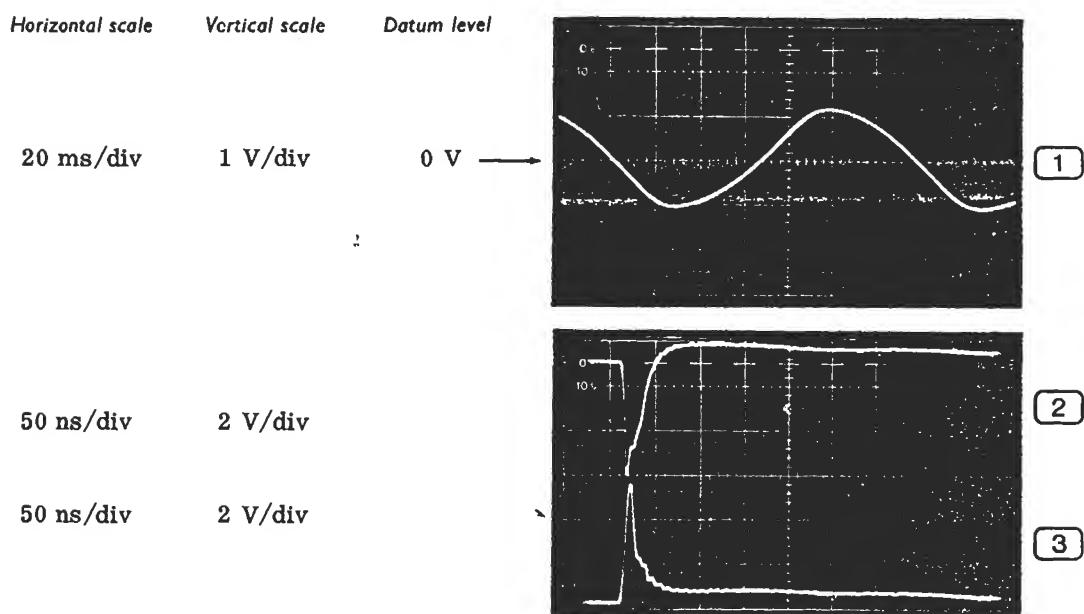
Fig. 7.11 Circuits: AA2, AA4

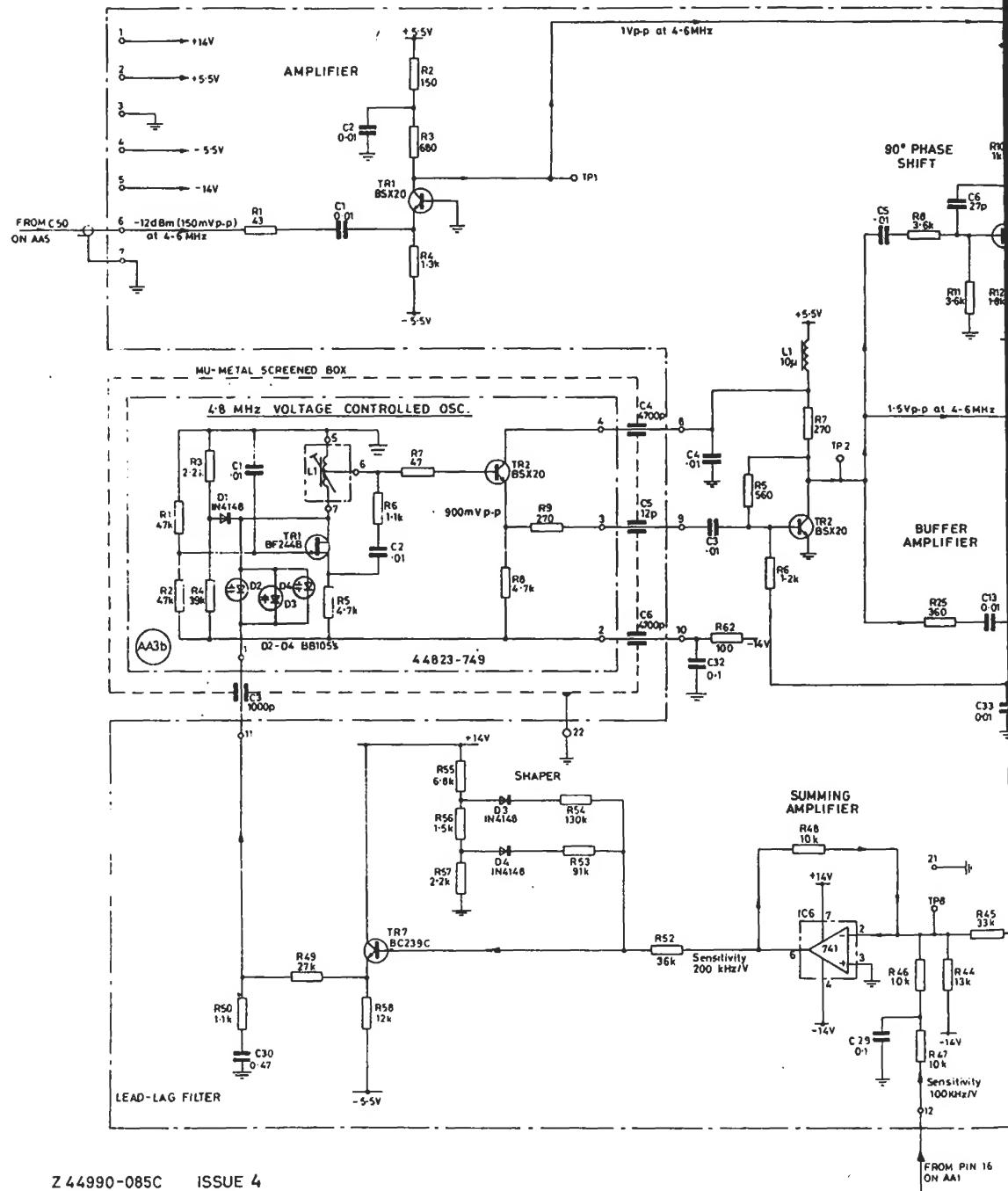
## Waveforms for AA3

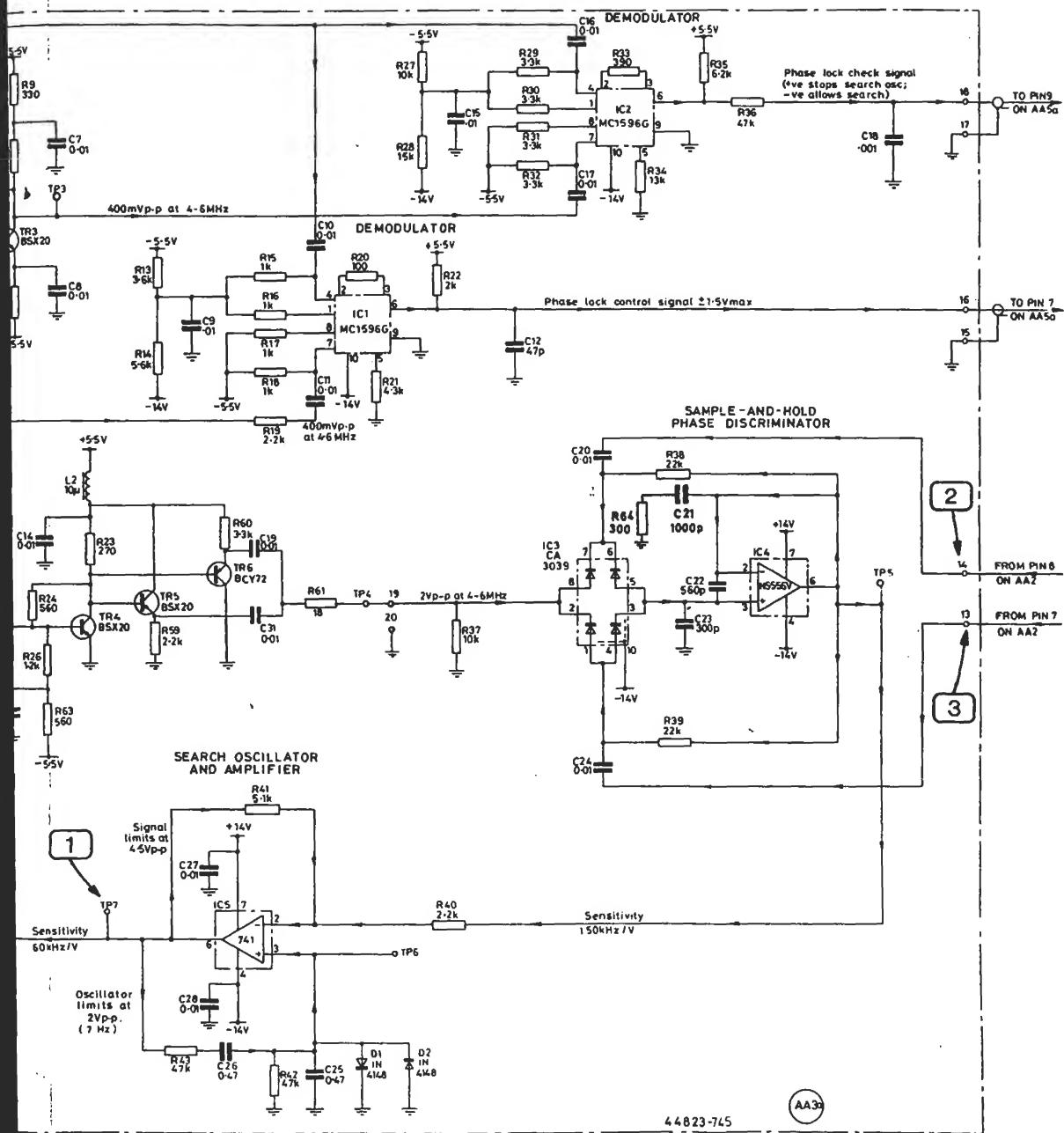
**Note** Probe connections and earth leads should be as short as possible.

TF 2370 controls - SWEEP MODE : AUTO  
HORIZONTAL SCALE and RANGE : 10 MHz/DIV  
FILTER BANDWIDTH : WIDE

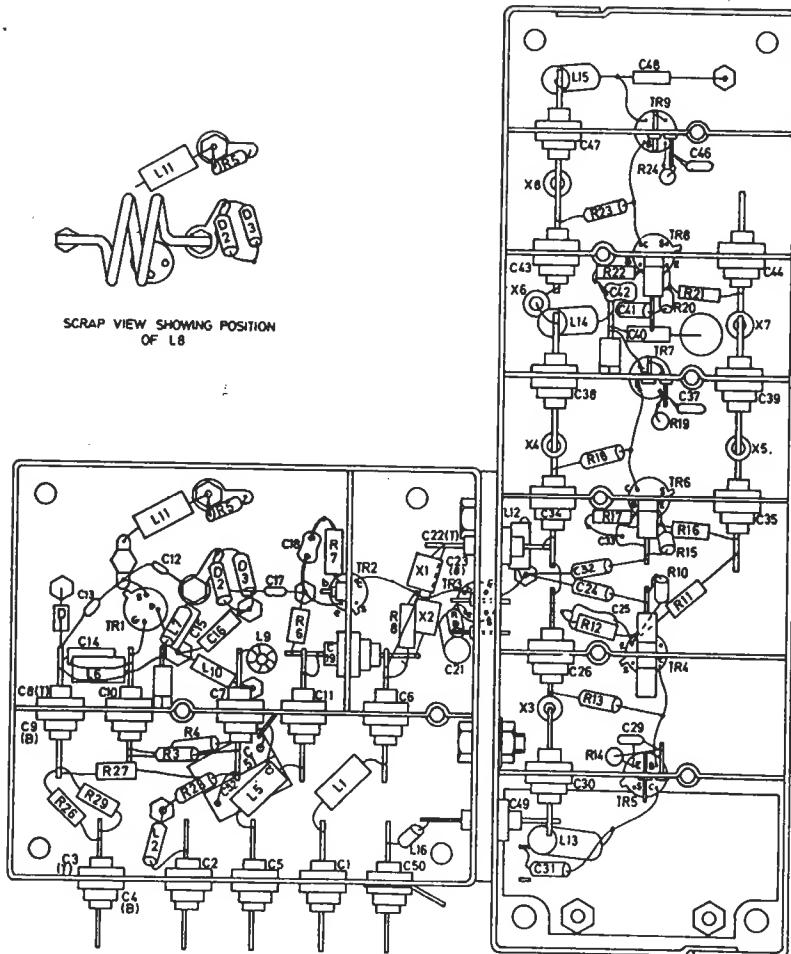
For (1), connect TP5 to earth.







Layout of AA5

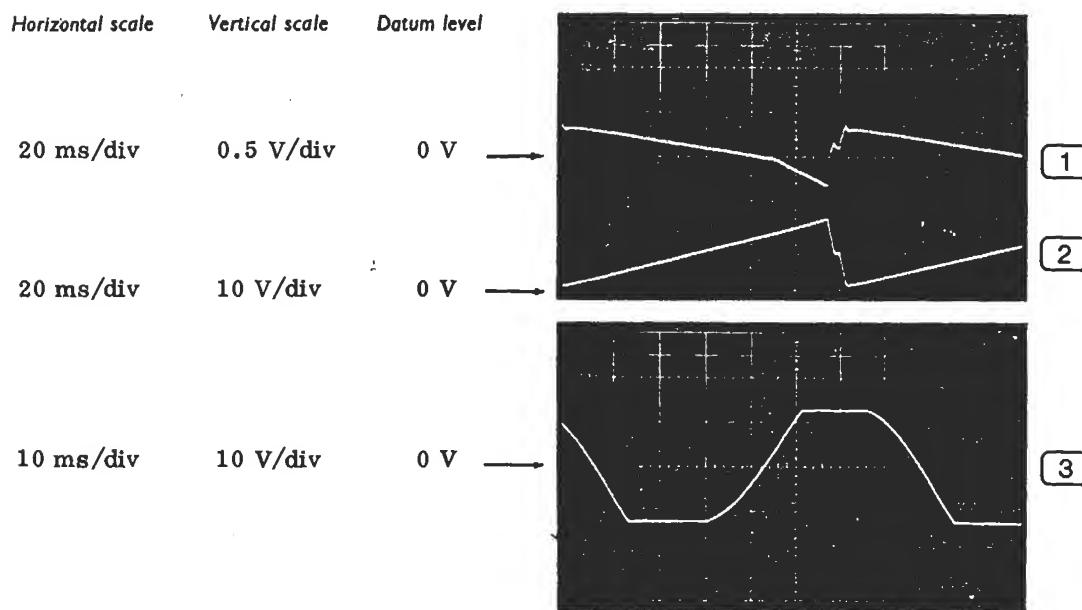


## Waveforms for AAs

**Note** Probe connections and earth leads should be as short as possible.

TF 2370 controls - SWEEP MODE : AUTO  
HORIZONTAL SCALE and RANGE : 10 MHz/DIV  
FILTER BANDWIDTH : WIDE  
REFERENCE FREQUENCY : LH  
REFERENCE FREQUENCY 0-110 MHz : On half turn clockwise

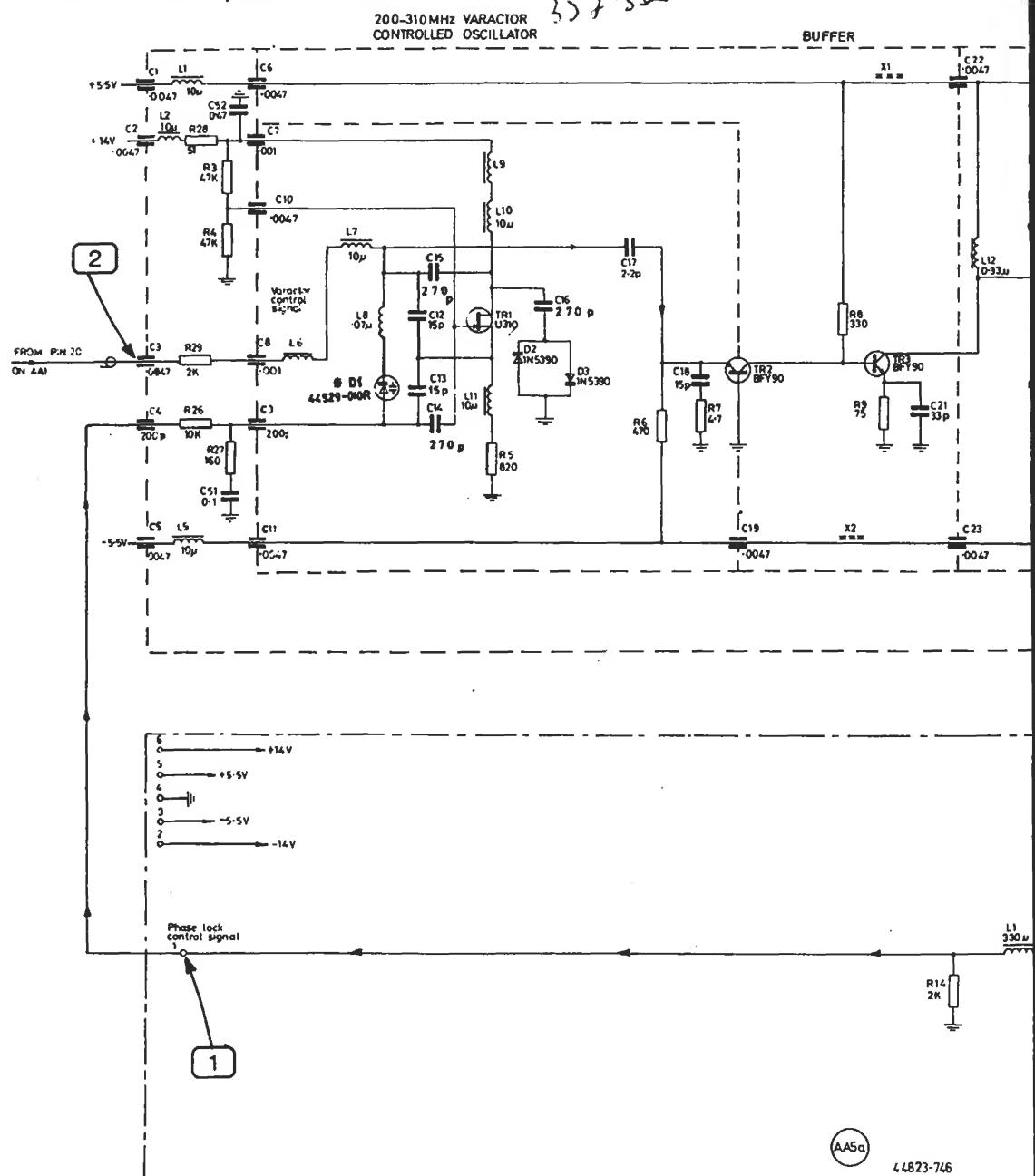
For (3), connect pin 9 to earth.



ewise

\* D1 is one of a matched pair. The other is  
fitted in a similar position on AA6.

357-500



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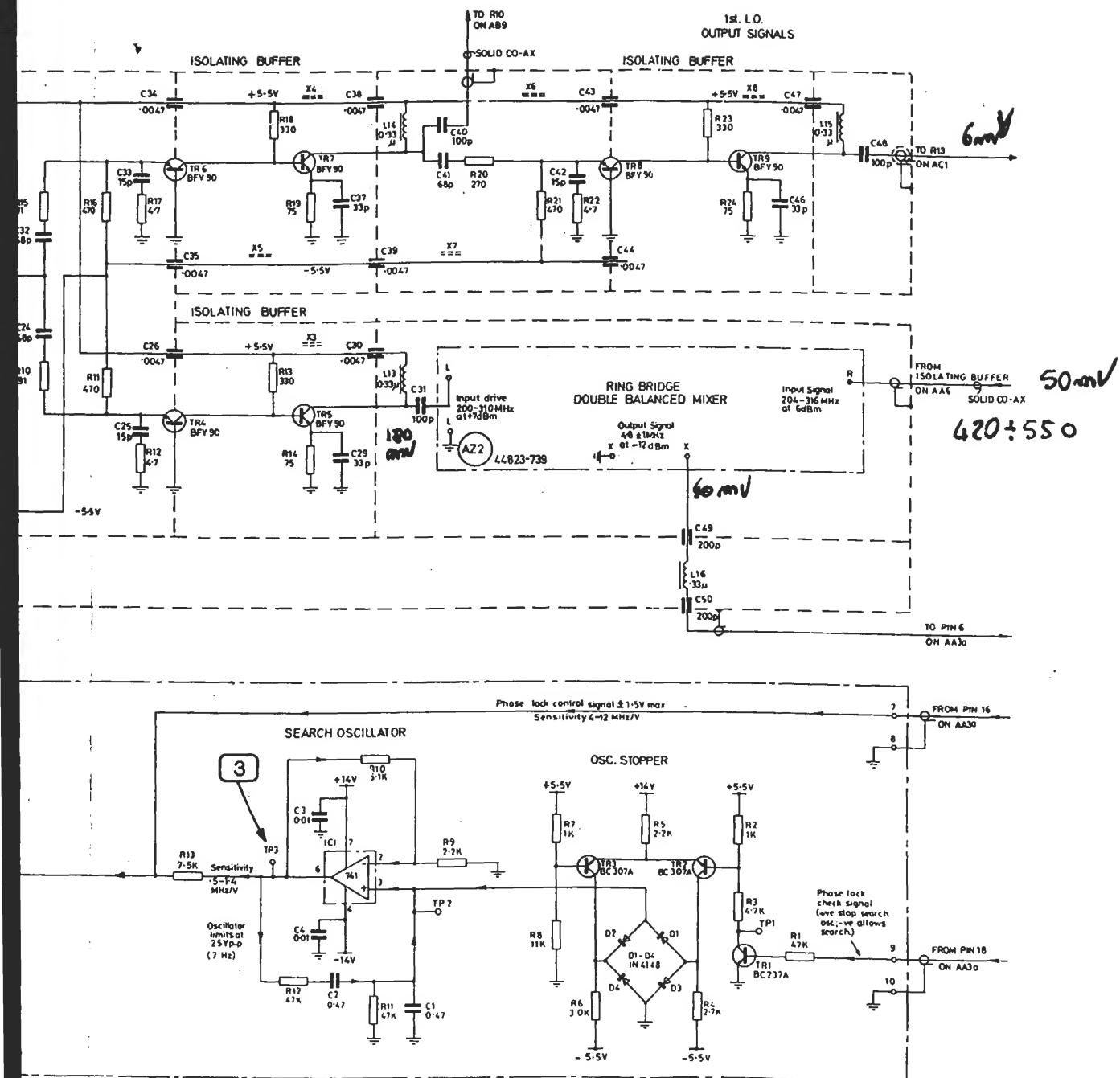


Fig. 7.13 200 to 310 MHz slave first local oscillator AAS

## Waveforms for AA6

**Note** Probe connections and earth leads should be as short as possible.

TF 2370 controls - SWEEP MODE : (1) to (5) AUTO  
(6) to (8) MANUAL

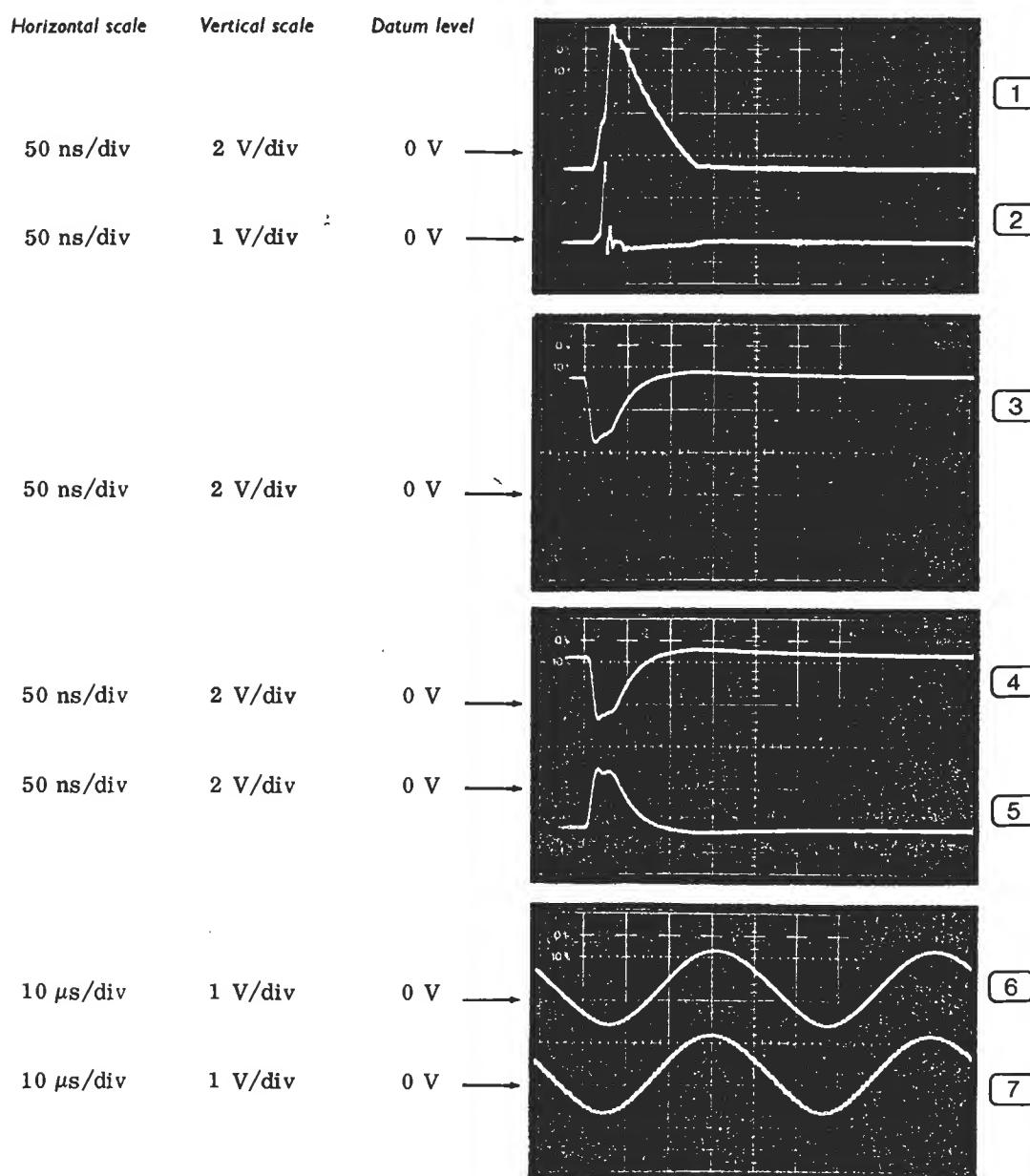
HORIZONTAL SCALE and RANGE : (1) to (5) 10 MHz/DIV  
(6) to (8) 10 kHz/DIV

FILTER BANDWIDTH : WIDE

REFERENCE FREQUENCY 0-110 MHz : For (6) and (7),  
adjusted to give a maximum amplitude sine wave

For (6) and (7), connect pin 1 on AA6a to earth.

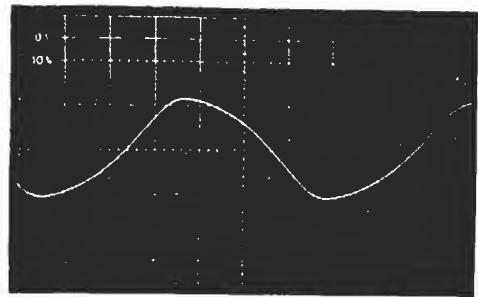
For (8), connect TP2 on AA6a to earth.



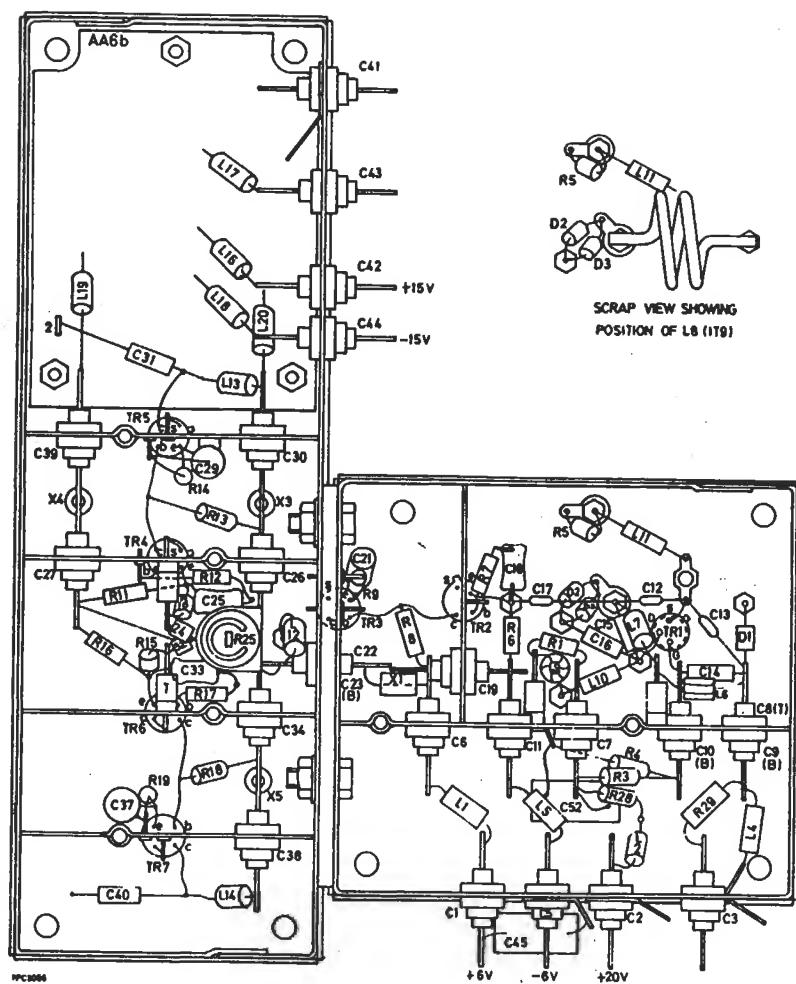
10,ms/div

1 V/cm

0 V →

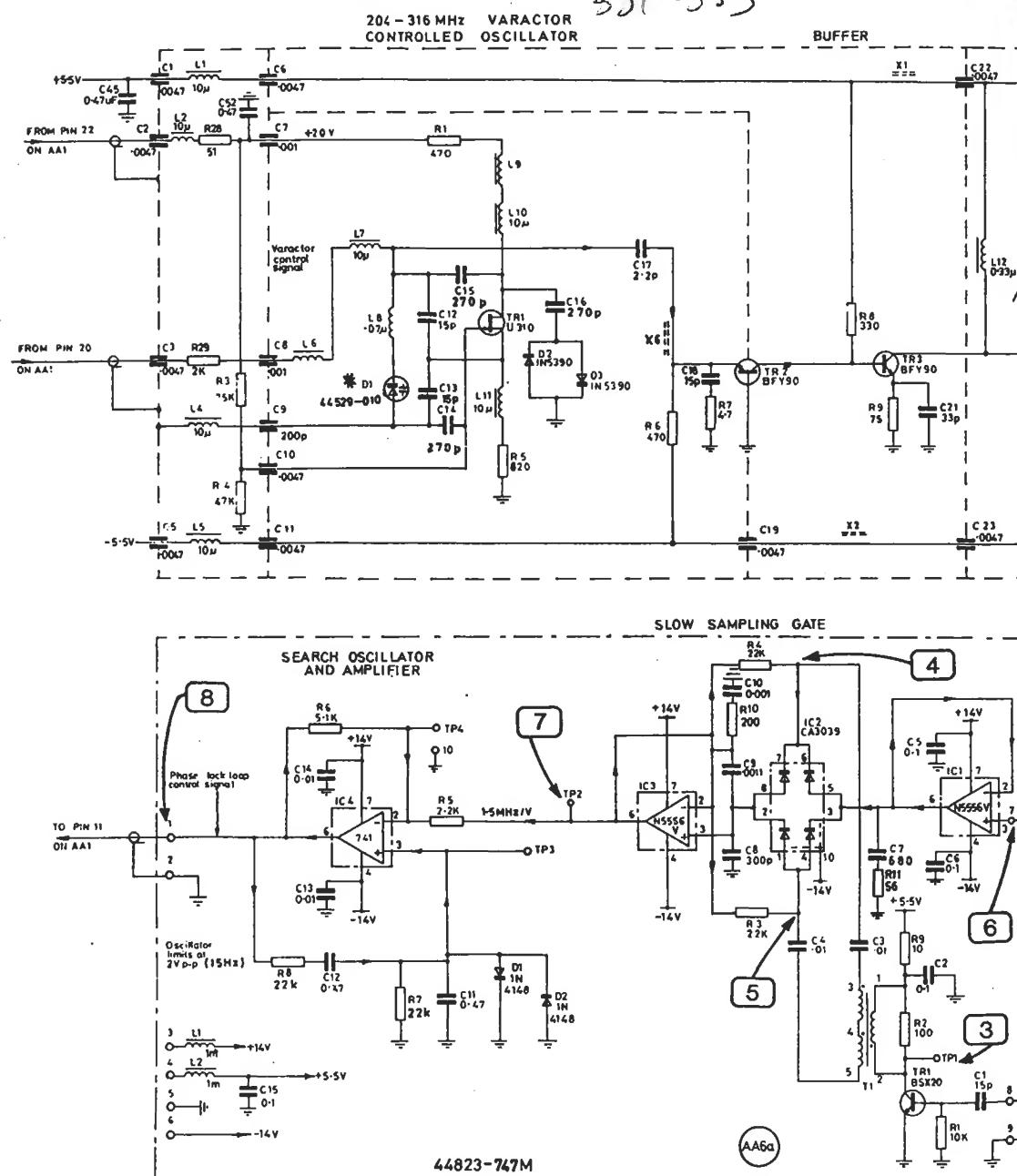


Layout for AA6



\*D1 is one of a matched pair. The other is fitted in a similar position on AA5.

381-553



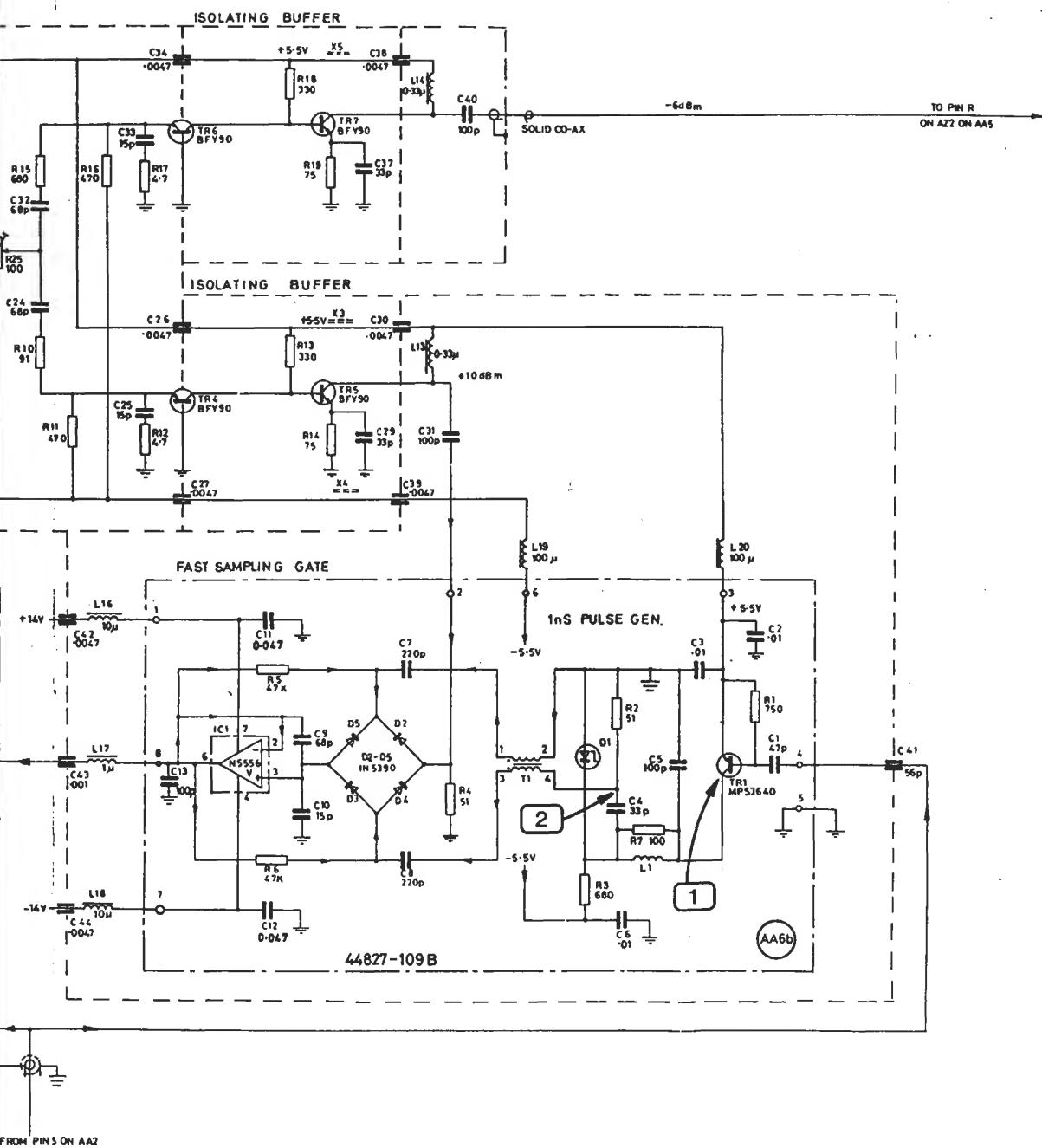
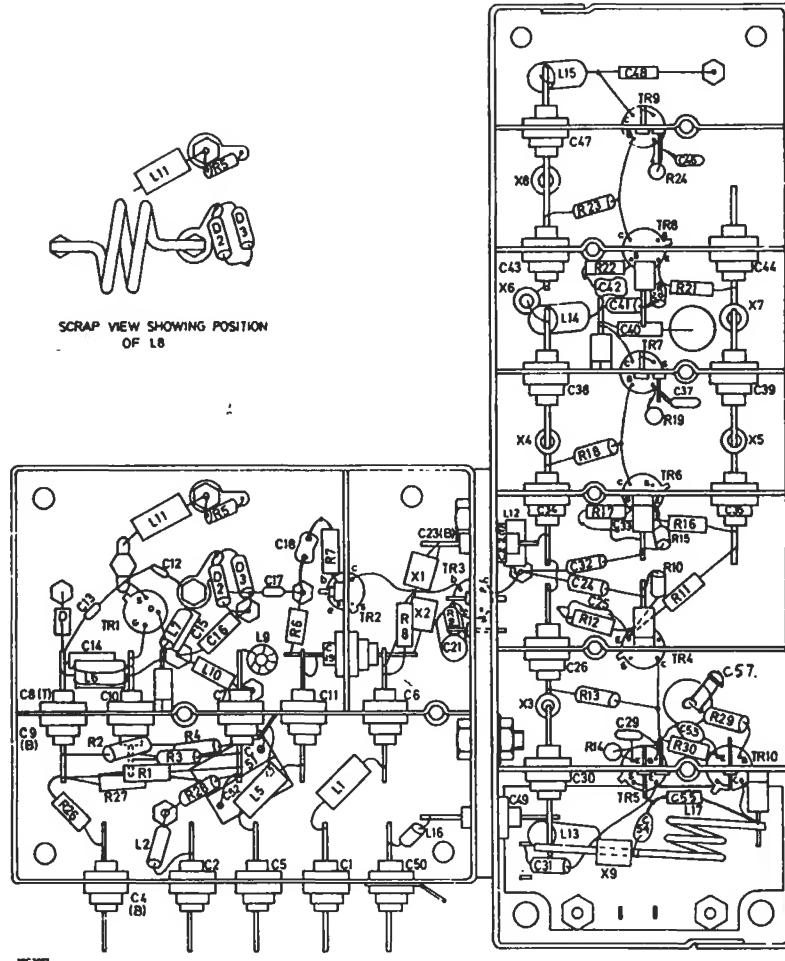


Fig. 7.14 205 to 315 MHz master first local oscillator AA6

## Layout for AA7



## Waveforms for AA7

**Note** Probe connections and earth leads should be as short as possible.

TF 2370 controls - **SWEET MODE : AUTO**

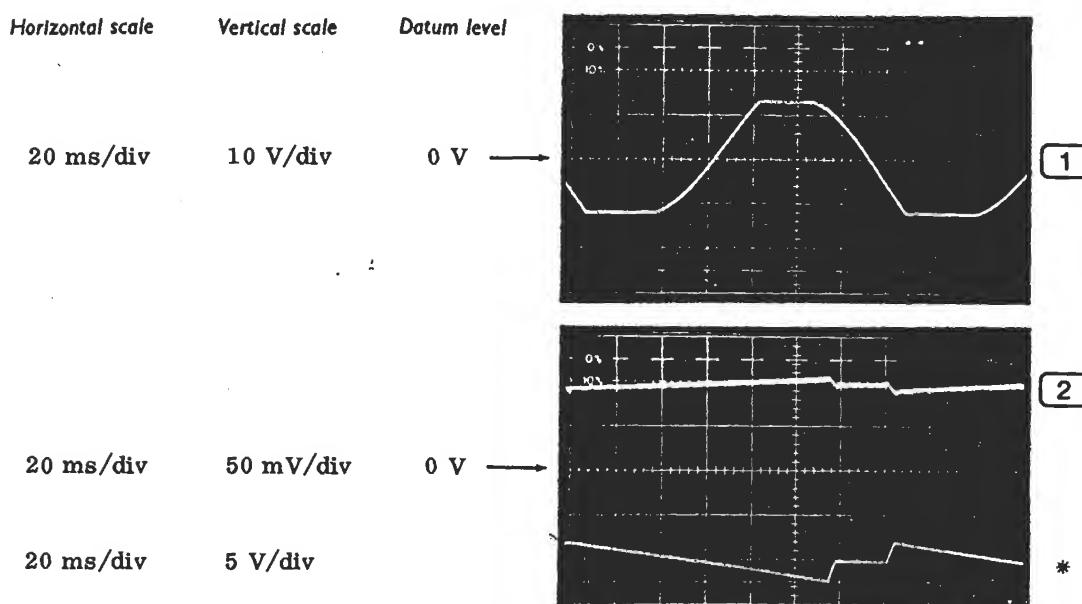
**HORIZONTAL SCALE and RANGE : 10 kHz/DIV**

**FILTER BANDWIDTH : WIDE**

**REFERENCE FREQUENCY : LH**

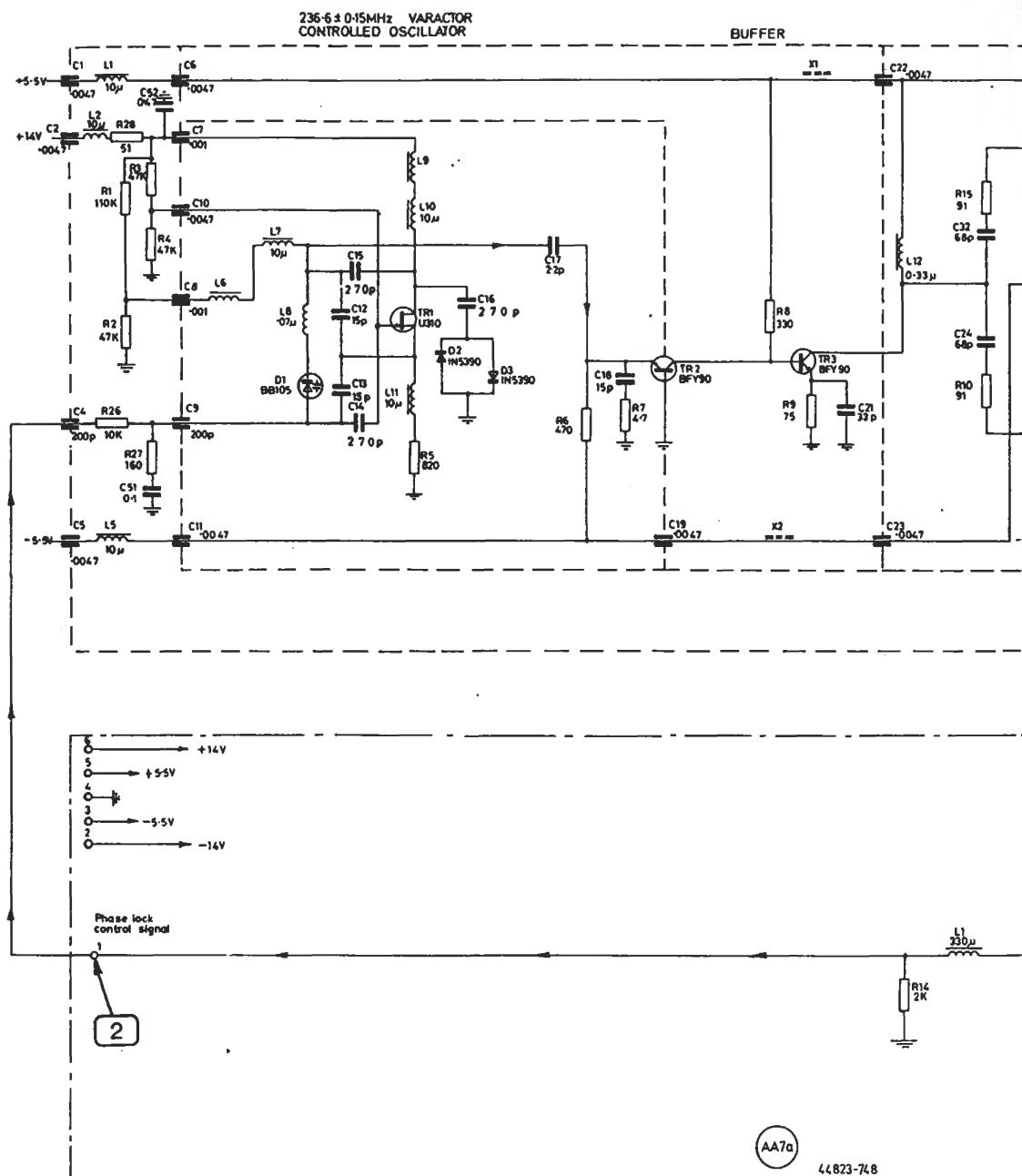
**REFERENCE FREQUENCY  $\pm 70$  kHz : Fully counter-clockwise**

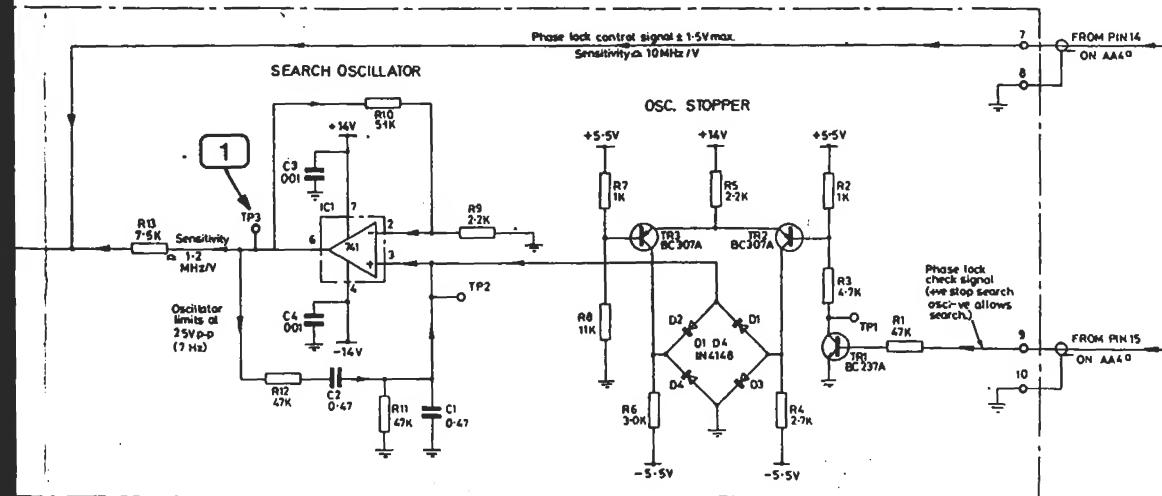
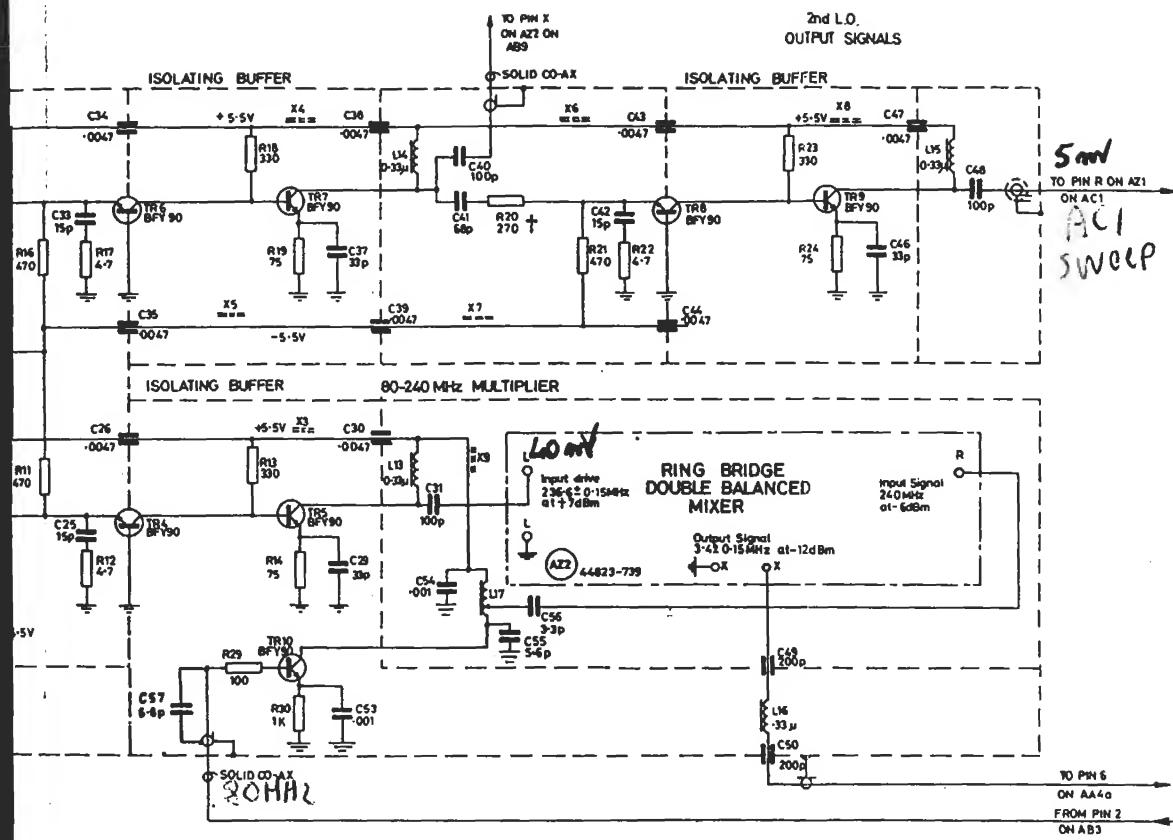
For (1), connect pin 9 to earth.



\* TP7 on AA1, for timing comparison

357-





## Waveforms for ACS

TF 2370 controls - SWEEP MODE : (8) to (14) AUTO for preliminary adjustments and then MANUAL to display the waveforms

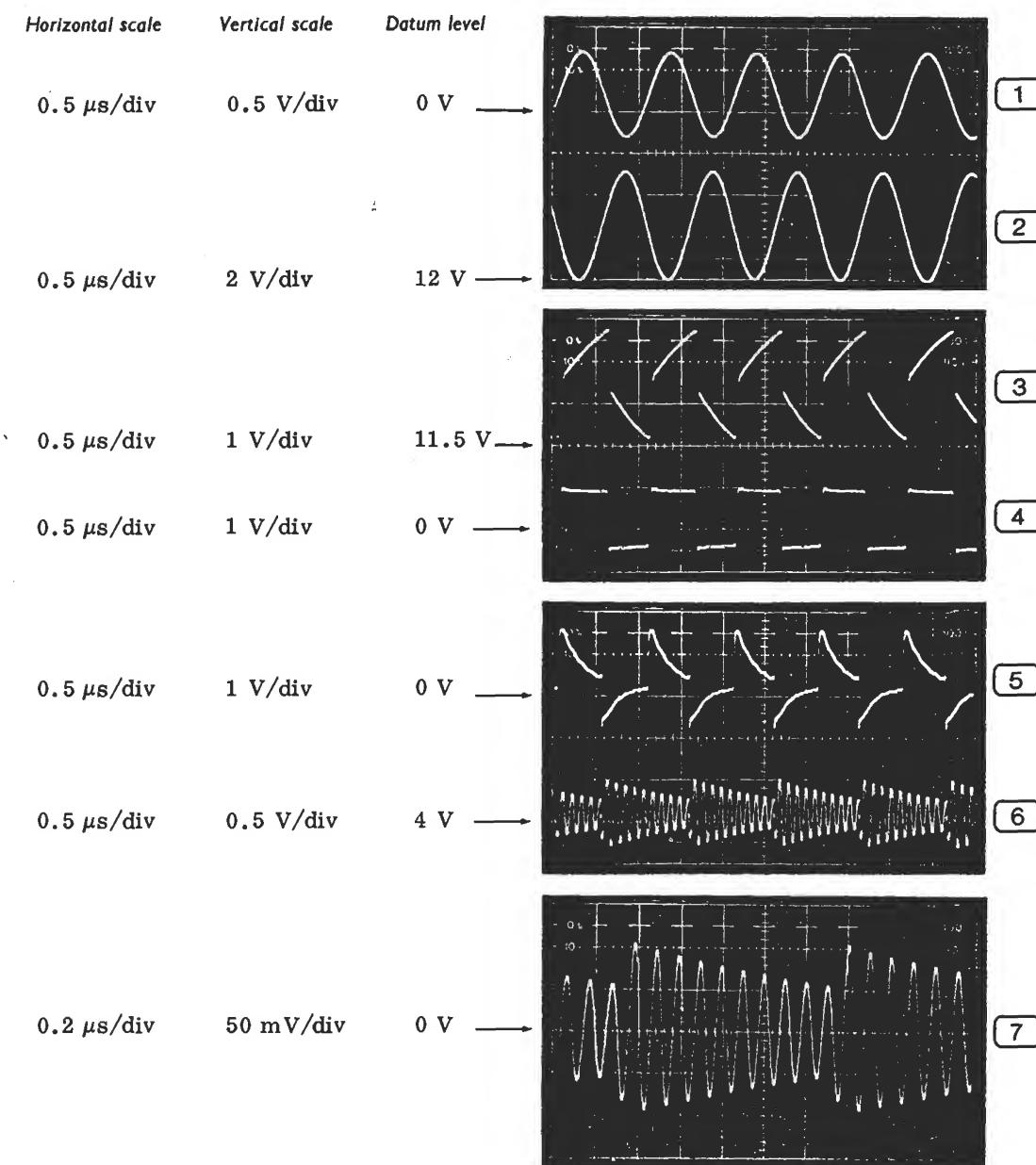
HORIZONTAL SCALE and RANGE : (8) to (14) 10 kHz/DIV

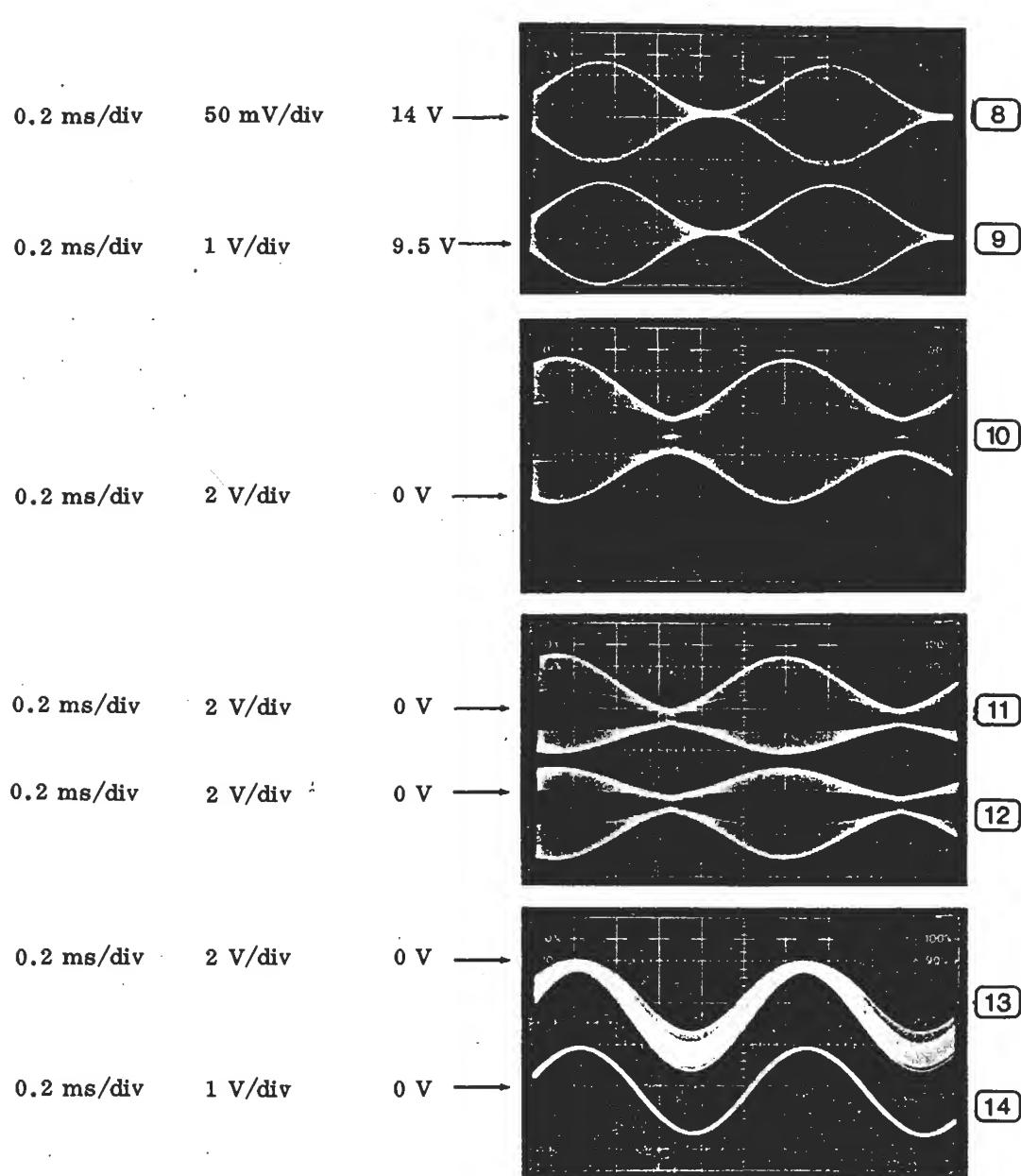
FILTER BANDWIDTH : (8) to (14) WIDE

VERTICAL SCALE and RANGE : (8) to (14) 0 dBm 1 dB/DIV

For (1) to (7), feed a 1 MHz (accuracy better than 1 in  $10^7$ ) 1 V p-p signal to the EXTERNAL STANDARD INPUT.

For (8) to (14), feed a 10 MHz signal to the INPUT. Adjust the signal level to give a display on the CATHODE RAY TUBE of the full height of the graticule. Then set the SWEEP MODE to MANUAL and adjust the BRIGHT LINE POSITION to the centre of the signal on display. Also amplitude modulate the 10 MHz signal at 1 kHz to 100% and load the DETECTED OUTPUT with 600  $\Omega$ .





E

9

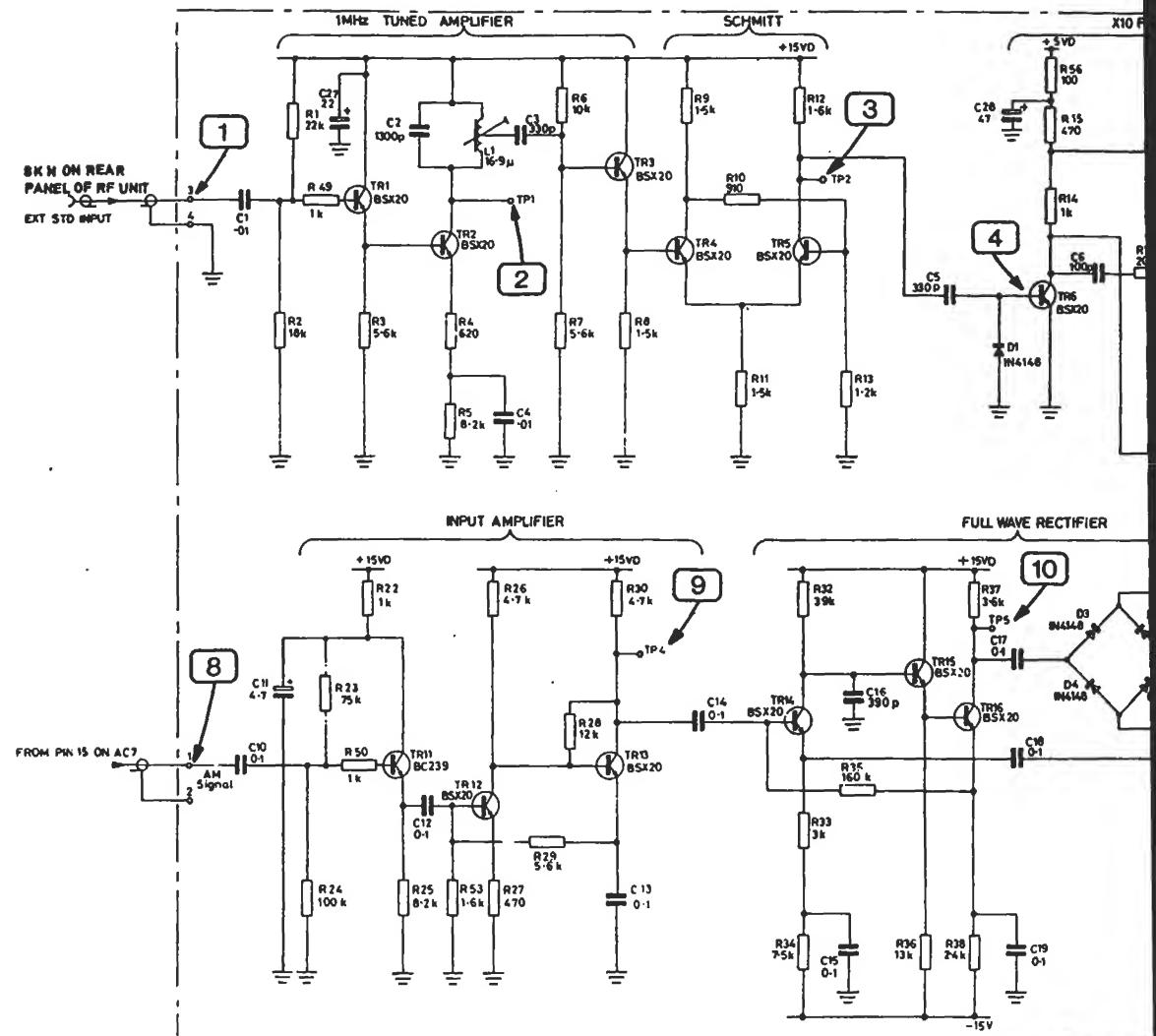
10

11

12

13

14



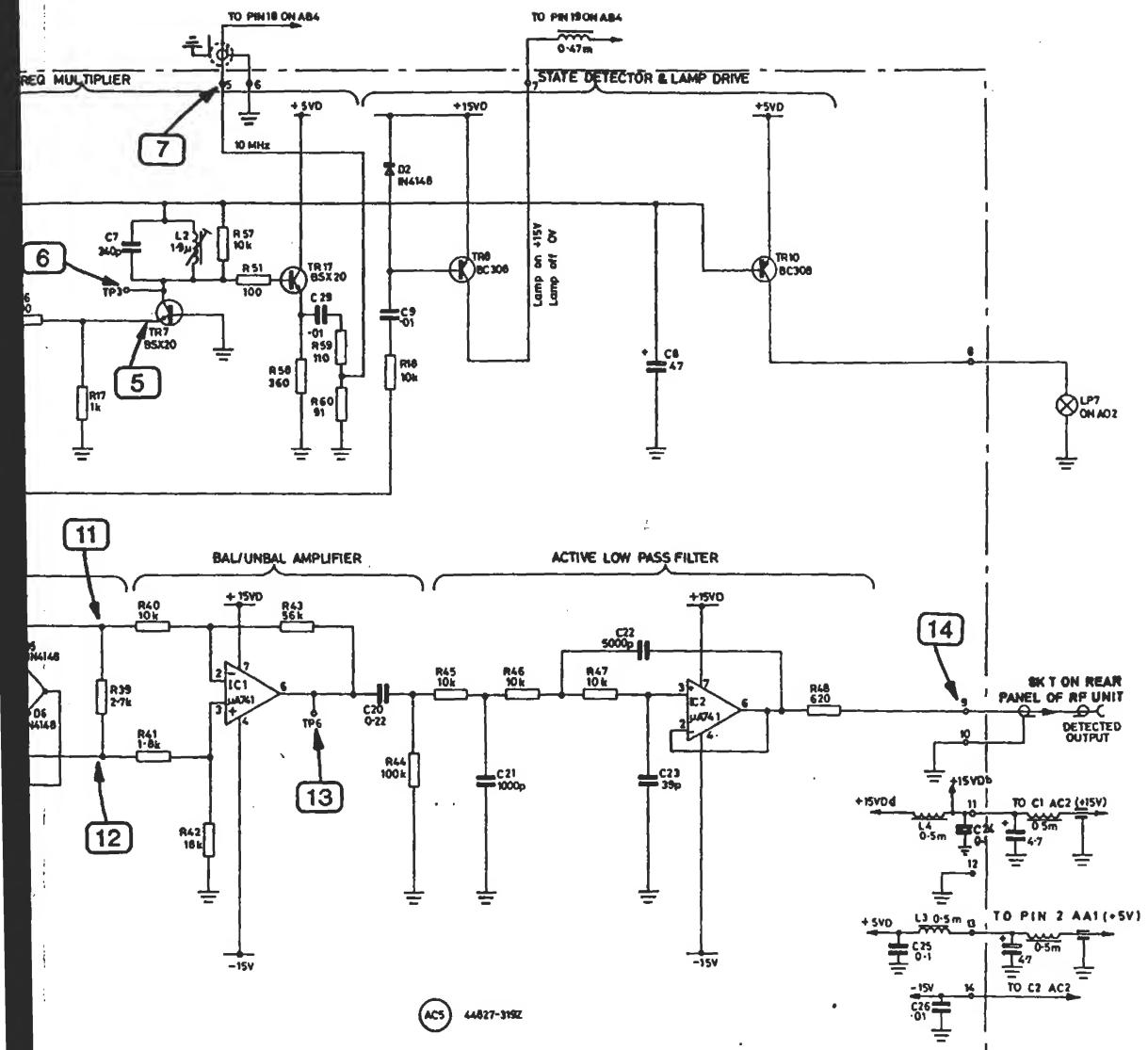
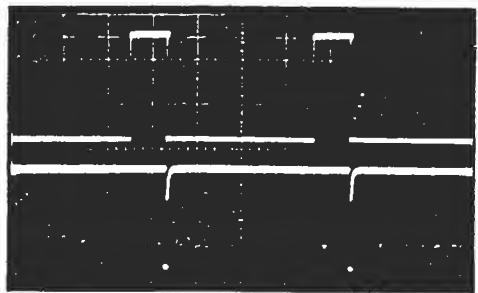


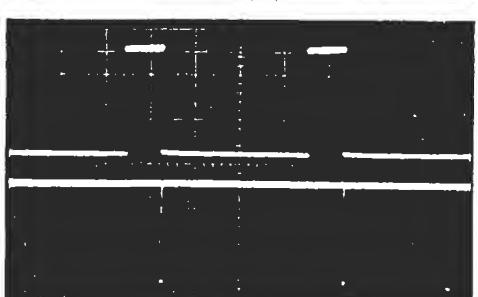
Fig. 7.16 Detector and external reference signal amplifier ACS

50  $\mu$ s/div 2 V/div



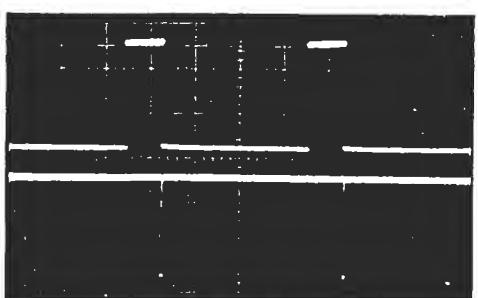
36

50  $\mu$ s/div 2 V/div



37

0.5 ms/div 2 V/div



38

0.5 ms/div 2 V/div

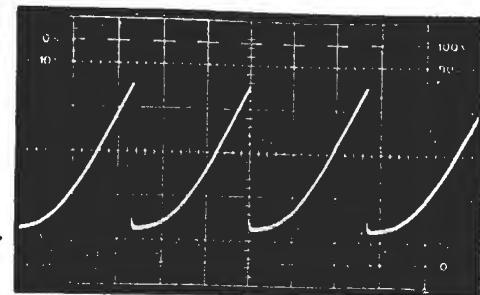


39

5 ms/div

2 V/div

0 V →

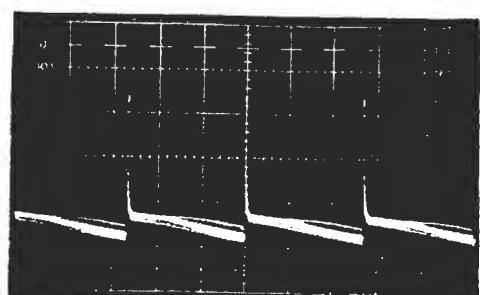


17

5 ms/div

50 V/div

0 V →

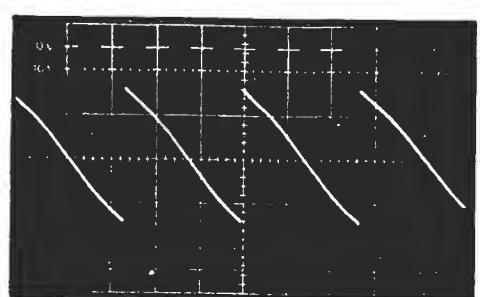


18

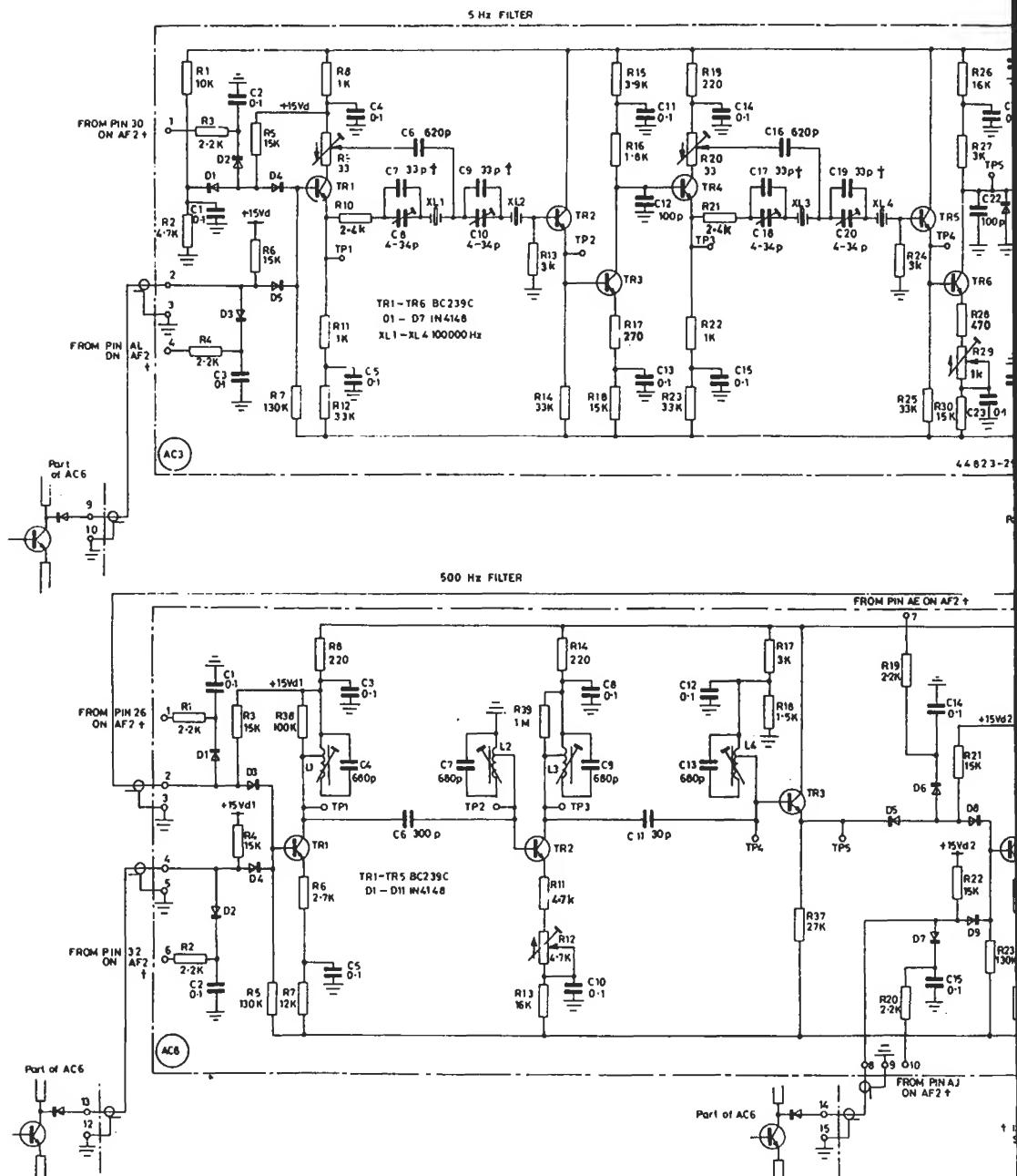
5 ms/div

1 V/div

0 V →



19



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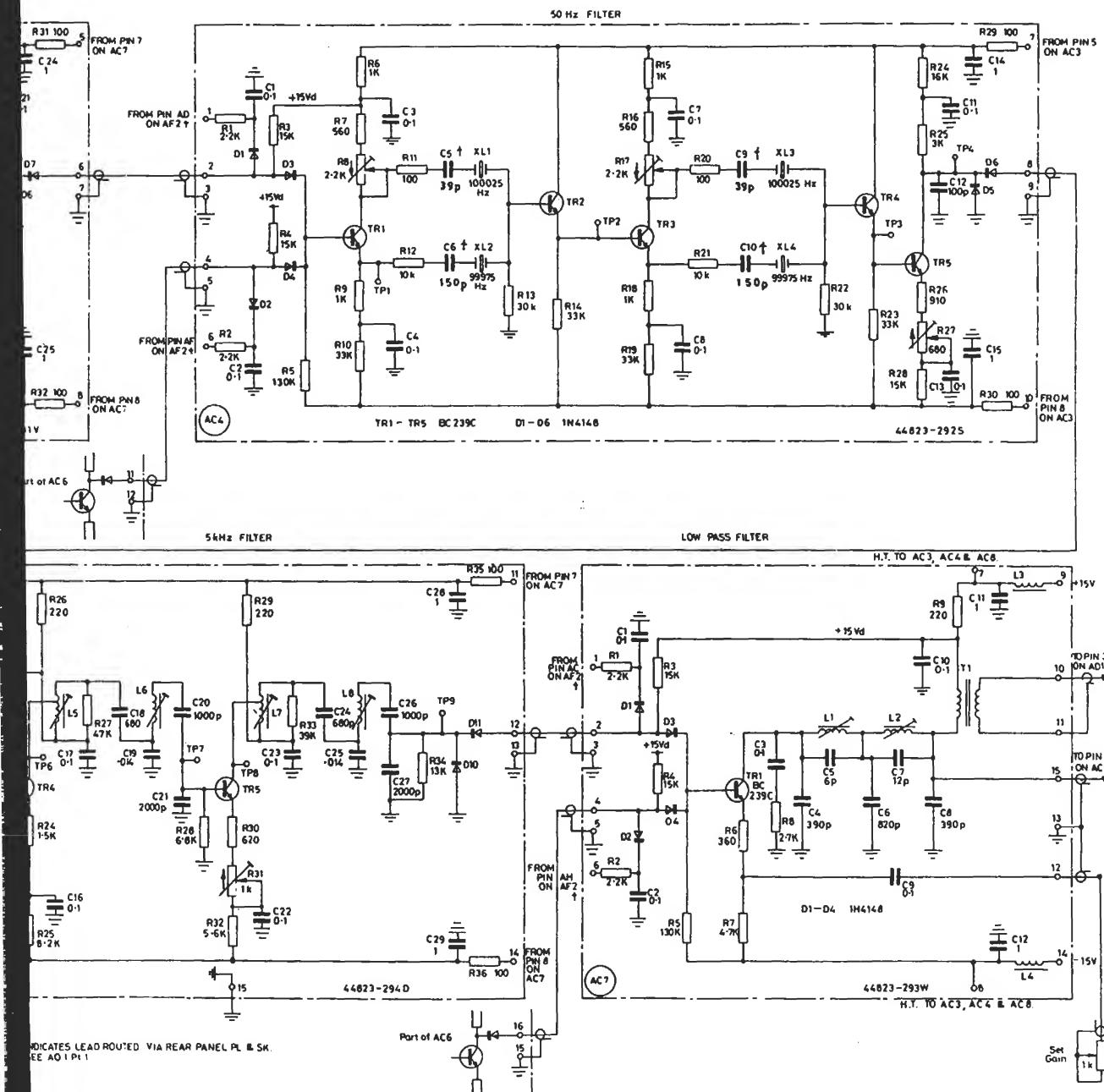


Fig. 7.17 Circuits: AC3, AC4, AC7 and AC8